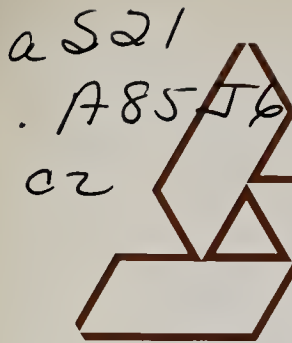


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Joint Council on Food
and Agricultural Sciences

November 1989

1989 Accomplishments for Research, Extension, and Higher Education

A Report to the Secretary of Agriculture

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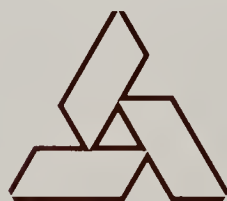
The Joint Council on Food and Agricultural Sciences was established by Congress in 1977 to encourage and coordinate research, extension, and higher education activities in the food and agricultural sciences throughout the United States. Its members, who are from both the public and private sectors, represent producers, industry, and State and Federal agencies and institutions. The Council's role was strengthened in the 1981 Agriculture and Food Act, which directed the U.S. Department of Agriculture to improve the planning and coordination of research, extension, and higher education within both the public and private sectors and to relate the Federal budgeting process to the overall functioning of the system. The Joint Council's responsibilities were reaffirmed in the Food Security Act of 1985.

In 1984 the Joint Council published a long-term (20 years) *Needs Assessment* of the food, fiber, and forestry products sectors, with particular emphasis on the supporting role of the food and agricultural science and education system. This report was published in two volumes: *Reference Document: Needs Assessment for the Food and Agricultural Sciences*; and *Summary: Needs Assessment for the Food and Agricultural Sciences*. The congressionally mandated responsibilities and the material in these two documents provide the foundation for the Joint Council's activities.

A strategic planning and review process continues to facilitate and enhance the coordination, planning, and financial relationships of research, extension, and higher education programs within the food and agricultural sciences and provides the foundation for planning an effective means of meeting the future national and international demands for food, fiber, and forest products.

The Joint Council publishes three reports to meet its mandate. They assess long- and short-term needs; identify problems and opportunities requiring concentrated efforts in the near future; and present a sampling of recent achievements that have contributed to the success of the agricultural sector.

- The *Five-Year Plan* identifies the challenges that the food, fiber, and agricultural production system faces, and the goals and objectives necessary to adequately address them. The report is updated biennially and provides overall guidance and direction to the food and agricultural science and education system within the U.S. Department of Agriculture and its cooperating institutions.
- The *Priorities Report* outlines the current national emphases of research, extension, and higher education programs in the food and agricultural sciences. This annual report presents the national priorities for the next fiscal year.
- The annual *Accomplishments Report* features examples of the significant achievements produced by efforts in research, extension, and higher education.



The Joint Council symbol represents the Council's primary responsibility: to improve coordination and planning among research, extension, and higher education programs. It also characterizes the cooperative spirit that exists among the Federal, State, and private organizations and institutions within the food and agricultural science and education system.



Joint Council on Food and Agricultural Sciences

Secretariat:
Suite 302 Aerospace Building
U.S. Department of Agriculture
Washington, D.C. 20250-2200

November 30, 1989

Honorable Clayton Yeutter
Secretary of Agriculture
Washington, D.C. 20250

Dear Mr. Secretary:

The U.S. agricultural system is unequalled in today's world in terms of the variety, quantity, quality, and safety of foods made available at reasonable prices to consumers. The effective continued production, marketing, processing, and distribution of the Nation's food, agricultural, and forest abundance are of significant social, economic, and political importance.

Yet complex challenges confront U.S. agriculture--challenges of responding to competition in the global marketplace; ensuring a profitable, sustainable food and agricultural sector; safeguarding natural resources and the environment; ensuring good nutrition and a high-quality food supply; and revitalizing rural America.

The 1989 Accomplishments Report for Research, Extension, and Higher Education documents the responsiveness of the food and agricultural science and education system as it strives to discover and implement solutions to these challenges.

This year's report provides an in-depth look at some of the accomplishments generated in 22 different subject areas. Many of the achievements illustrate an integrated and cooperative approach as the science and education system works together with others.

We are pleased to convey the 1989 Accomplishments Report to you on behalf of the Joint Council on Food and Agricultural Sciences.

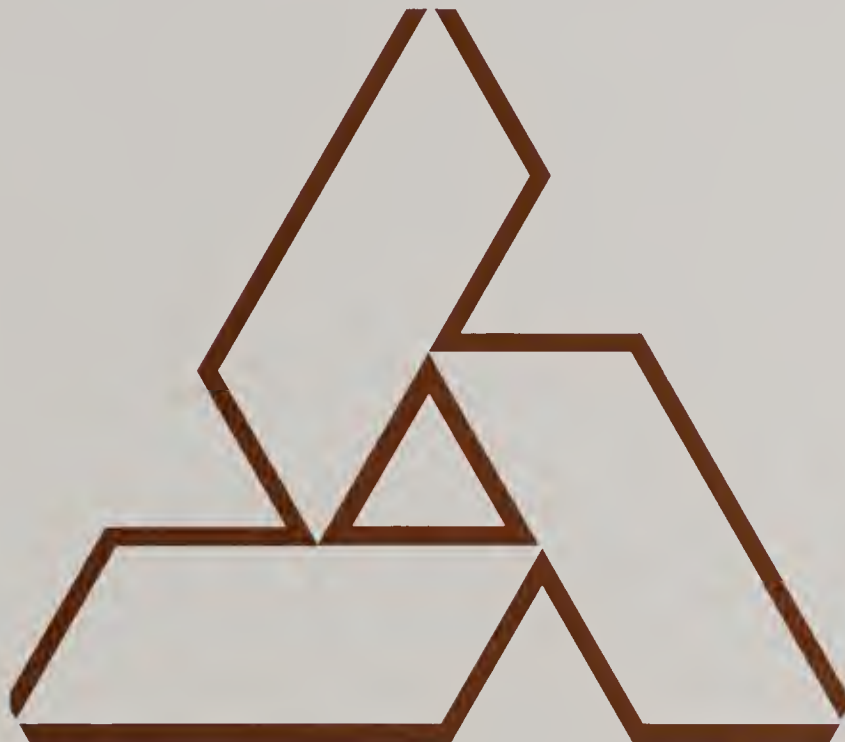
Sincerely,

CHARLES E. HESS
Cochair

H. ROUSE CAFFEY
Cochair

1989 Accomplishments for Research, Extension, and Higher Education

A Report to the
Secretary of Agriculture



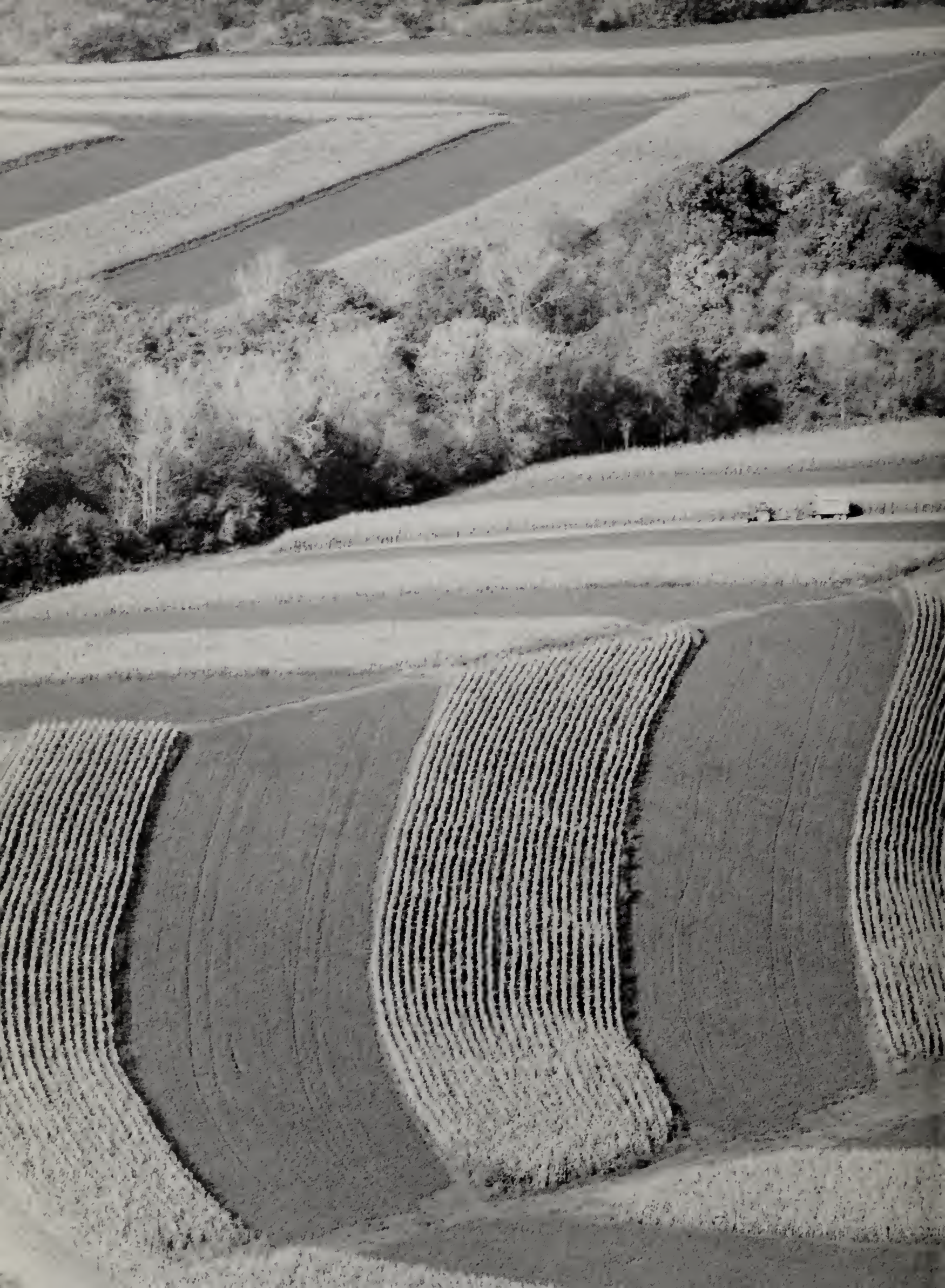
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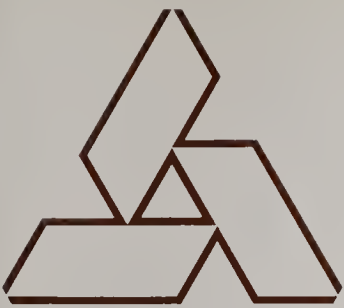
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I. Preface

For more than 100 years, investments in agricultural education, research, and extension activities have contributed to factors such as improved farming methods, animal and plant disease control, and more profitable farm management methods. Today, there is nothing comparable to U.S. agricultural production in terms of the variety, quantity, quality, and safety of foods made available at very reasonable prices to consumers. The effective continued production, marketing, processing, and distribution of the Nation's food, agricultural, and forest abundance are of significant social, economic, and political importance.

Yet complex challenges confront U.S. agriculture—challenges of responding to aggressive competition in the global marketplace; ensuring a profitable, sustainable food and agricultural sector; safeguarding natural resources and the environment; ensuring good nutrition and a high-quality food supply for the Nation's people; and revitalizing rural America.

The *1989 Accomplishments Report* records the responsiveness of the food and agricultural science and education system, and its entities of research, extension, and higher education, as it strives to discover and implement new and better solutions to these complex challenges. Many examples in the report illustrate an integrated and cooperative approach to solutions as the science and education system works together with other Federal and State organizations.

The *1989 Accomplishments Report* contains just a sampling of the many significant achievements that were produced by the nationwide food and agricultural science and education system. Many of the documented accomplishments required years of scientific research, education, and/or preparation. In and of themselves, these accomplishments have merit. They are worth much more, however, when they are added to the existing knowledge base, and also when they are linked to those priorities targeted as necessary for the continued improvement of the Nation's food and agriculture system.

The accomplishments are divided into sections for easy reading:



Agricultural Productivity, Profitability, and Competitiveness

Input, supply, production, processing, and marketing of food, natural fiber, and forest products account for approximately 15 to 20 percent of both the U.S. gross national product and employment. The ability to export the Nation's agricultural products abroad, however, is hampered by barriers to international trade.

This section of the Accomplishments Report documents the responsiveness of the food and agricultural science and education system as it continues to: improve the productivity and the profitability of food, fiber, and forest products in a manner that is compatible with the environment; identify profitable alternatives to traditional agricultural enterprises and products; and analyze foreign markets and trade policies to determine strategies to improve U.S. competitiveness in the global marketplace.



Education and Technology

The competitiveness of the United States is directly related to its competitive edge in technology and in scientific and professional expertise. Recent reports commissioned by the U.S. Congress, the Executive Office of the President, the National Academy of Sciences, the National Science Foundation, and the U.S. Department of Education confirm that those countries that possess and use scientific and technical skills in the food and agricultural sector stand the best chance to lower trade- and policy-related costs associated with remaining competitive in world markets.

This section provides an account of the advances in: biotechnology research; recruitment and retention of students in the agricultural sciences; development of agriculture and business expertise at both the high school and university levels; and innovative technologies that are used for training individuals and for disseminating information.



Environment and Natural Resources

American agriculture is an economic and strategic resource that is critical to the maintenance of national security. Agricultural production, however, has not been without associated concerns related to soil erosion, degradation of water, chemical residues in food and water, and endangered species.

This section portrays the successful scientific, technological, and educational approaches directed toward: improving the quality of the Nation's water resources; establishing permanent cover on highly erodible cropland; and using natural biological methods to control pests and diseases of plants and also to degrade offensive chemicals in the environment. These accomplishments are focused on achieving sustainability, the term applied to the concept that agricultural production and environmental protection are mutually compatible objectives.



Food, Diet, and Health Relationships

The United States has the most abundant, wholesome, and nutritious food supply in the world. Many experts believe that lack of essential nutrients is no longer the major nutritional problem facing most Americans. Instead, lifestyle factors, including diet, are major contributors to health problems such as heart disease, hypertension, cancer, diabetes, and other chronic diseases.

The United States has the safest food supply in the world. However, chemical and microbial contaminants found recently in the food supply have diminished consumers' confidence in the safety of their foods.

This section records the responsiveness of scientists and professionals to these issues as they: identify new relationships between diet, nutrition, and health; alter the composition of foods to remove cholesterol and fat; and develop techniques and comprehensive educational programs to prevent contamination of foods. Examples of the transfer of this information from the laboratory to the consumer are presented.



Rural America

Most of the production of food, fiber, and forest products occurs in rural America, and the stewards of nearly 90 percent of the Nation's land and water resource base reside there. Rural America is the source of much of the Nation's clean water, clean air, and other environmental amenities. Sustaining rural employment for adults and youth, incomes, and local government vitality requires competitive, profitable rural enterprises and effective public organization and management.

This section documents results of technology transfer programs, educational seminars, and information networks targeted to enhancing the economic development of rural areas by: increasing the number of small businesses and employment opportunities; forming economic development organizations; and using energy surveys to decrease energy costs to small businesses.



Youth, Families, and Communities

Families, youth, and elderly live in a world today that is very different from the one that existed a generation ago. Many youth are considered "at risk" and are faced with problems of drug abuse, school dropout, teen pregnancy, and lack of support. Many families are being affected by changing employment opportunities, dislocation, and inadequate skills and resources. The quality of life for older rural Americans is affected by their incomes, health, and geographic isolation.

This section documents how professionals and volunteers were mobilized and trained to offset some of the societal problems that youth, adults, and communities are experiencing. Some examples of positive results of these efforts include: implementing prevention and intervention programs for youth; establishing a database for youth development professionals; preparing people for leadership positions in organizations and communities; and empowering families with financial management and decisionmaking skills. Research on older rural adults continues to reveal their special needs and contributes to important State and national policies.



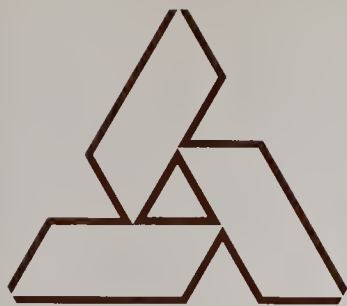
Joint Council, National Committees, and Regional Councils

Three National Committees and two Regional Councils provide significant guidance to the Joint Council in its efforts to coordinate research, extension, and higher education activities in the food and agricultural sciences throughout the United States.

This section notes the accomplishments of the Joint Council on Food and Agricultural Sciences, as well as the accomplishments of the National Agricultural Research Committee, National Extension Committee, National Higher Education Committee, Western Regional Council, and Northeast Regional Council.

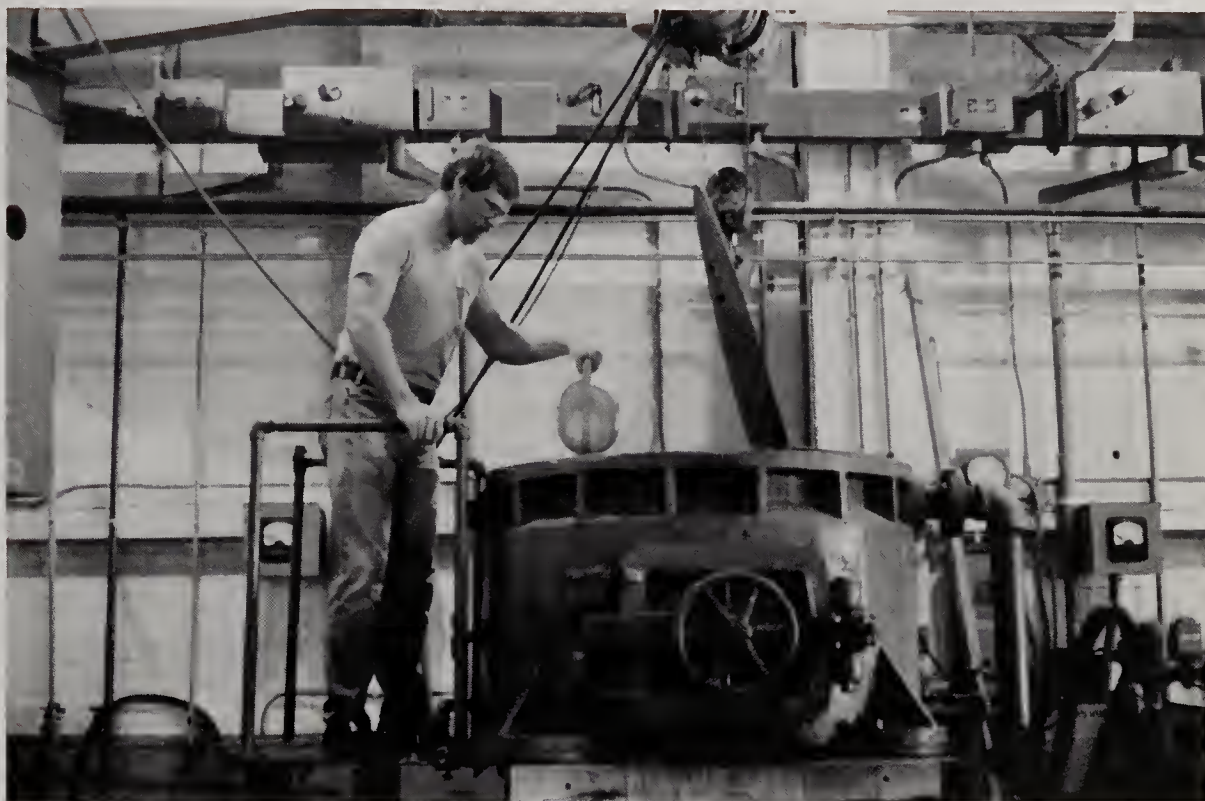
The *1989 Accomplishments Report* reflects the depth of expertise used by the science and education system to maintain and improve the Nation's agricultural abundance as well as the prosperity and health of its producers and consumers. Continued investments in research, extension, and teaching will help the system meet the identified challenges, capitalize on the innovations and technologies, and successfully launch U.S. agriculture into the 21st century.





II. Accomplishments – Agricultural Productivity, Profitability, and Competitiveness

Alternative Agricultural Opportunities*



A combination of economic, environmental, and political issues are causing people to consider alternatives to traditional agricultural enterprises. The potential for alternatives is being assessed: (1) at the farm level, (2) within product utilization, marketing, and production systems, and (3) on national and global scales. Considerations include alternative uses and/or markets for traditional products and new products to serve new purposes. Effective marketing, management, and production of alternative products require massive amounts of information, substantial communications networks, and extensive linkages among the parties to the enterprise. The USDA and land-grant university establishment is playing an indispensable role in helping the private sector achieve success in developing and implementing alternatives.

Developing and Commercializing New Products From Agricultural Commodities

The Agricultural Research Service (ARS) expanded research on production, protection, and improvement to include such crops as meadowfoam, crambe, lesquerella, and cuphea. ARS laboratories in Peoria, New Orleans, Philadelphia, Albany, and other sites develop new products from contemporary agricultural commodities. Examples from these programs include starch-based plastics, printer's ink from soybean oil, high-quality newsprint from kenaf, carbonated milk drinks from dried milk, and a no-calorie, high-fiber flour extender from cereal grain hulls and bran.

* Material for this section was provided by C. David McNeal, Jr. (coordinator) Extension Service, USDA; Daniel E. Kugler, Cooperative State Research Service, USDA; Alan G. Dexter, North Dakota State University and University of Minnesota; and Alfred R. Wade, Prairie View A&M University. L. R. Sprott, Donald J. Dorsett, and William B. Thomas, Texas A&M University, and James T. Hall, Agricultural Research Service, USDA, provided additional contributions to this section.

Commercialization of non-food agricultural technologies and products is a natural extension of decades of basic and applied research. Bridging the gap between laboratory results and successful commercialization requires demonstration projects that prepare farmers to produce and industry to utilize industrial raw materials from agriculture. The Cooperative State Research Service (CSRS) has these demonstration projects underway: kenaf for newsprint, guayule for natural rubber, and crambe/rapeseed for lubricating oils and plastics.

One of the results of these CSRS projects is a private-sector joint venture to build a kenaf newsprint mill in south Texas for operation in the early 1990's. This multimillion-dollar capital investment will require annual production from several thousand acres of kenaf. The mill will represent the first scale-up to commercial operation and will demonstrate the viability of the kenaf newsprint system; i.e., growing, harvesting, and delivery of fiber for quality paper manufacture and marketing.

National Initiative in Alternative Agricultural Opportunities (AAO)

The Cooperative Extension System began its national initiative in alternative agricultural opportunities (AAO) in late 1986 by identifying three potential program areas: alternative ways to market, manage, and produce traditional products; alternative products and/or services that can be produced from the farm/ranch resource base; and alternative employment opportunities for farm families.

The Extension Service (ES) National Initiative Team has provided focus on agricultural diversification through alternative products. The keystone of this effort is the development of comprehensive, compatible databases and linkages to provide educational programs on diversification. New York, North Carolina, and Minnesota are working closely with their Federal counterparts to build this base. Results related to the AAO initiative include:

- North Dakota Extension assisted in the formation of and provides support to the West Dakota Development Foundation, which finds markets for produce, recruits and organizes growers to supply markets, and provides information to growers.
- Clearwater County, Minnesota, received funding to conduct an education program for new vegetable producers. As a result, a new fresh market vegetable processing plant is in operation, and 25 new producers are in business. An increase in acreage is needed to meet market demands in 1990.
- Texas Agricultural Extension Service, including Texas A&M and Prairie View A&M universities, intensified their efforts in alternative enterprises for ranchers and can document diversification results in 100 counties. This includes low-income farmers and ranchers in 13 counties who increased their income by 17 percent.

-
- A sampling of results from programs on alternative management of traditional livestock species and operations include: (1) improving beef herd income from 13 to 100 percent over 4 years, (2) genetically changing protein and fat composition of milk to meet new markets, and (3) helping the horse industry respond to passage of pari-mutuel betting.
 - Results from management of alternative species or enterprises include: native pecan groves becoming commercial orchards, catfish and tilapia being raised by livestock producers, and the raising of exotic wildlife for meat or for sport hunting.

Diversification of agriculture and commercialization of new products from the renewable resources base are items of increasing public concern. Significant legislation relating to this has been entered in the 101st Congress, and the 1990 Farm Bill is expected to remove many of the current barriers to diversification. Research and educational programs on alternative agricultural opportunities are essential to successful diversification.

The Drought of 1988: Responses of the Research, Extension, and Teaching System*



One of the worst droughts of the century occurred early in 1988, and by the end of the summer no major production region was left untouched. The impact on most crop, livestock, and specialty farms was substantial—crop yields dropped and livestock often required costly supplemental feed or grew more slowly. Many farmers were just recovering from the financial stress of the mid-1980's. However, they were better able to withstand the drought's effects because of a vigorous and rapid response by the Federal Government and the university community. Results of research, extension, and teaching efforts were used by the Executive Office and Congress to shape the Disaster Assistance Act of 1988. Help took many forms and is an example of the strong network of understanding and cooperation developed over the years between USDA, the land-grant universities, and the Nation's farmers.

* Material for this section was provided by Donald Seaborg (coordinator), Economic Research Service, USDA; Keith Collins, Economic Analysis Staff, USDA; Dale Bucks, Agricultural Research Service, USDA; Gary Weber, Extension Service, USDA; and Preston Jones, Cooperative State Research Service, USDA.

As signs of a severe and extensive drought mounted, the Secretary of Agriculture formed a Drought Task Force on March 1, 1988. By April, intensive monitoring of climatic conditions was underway. On June 15, the President's Interagency Drought Policy Committee was formed. Extension and research staff at many universities also responded by mobilizing resources to address the situation.

These efforts, initiated by USDA and land-grant universities, provided scientifically based information and education to mitigate the impact of a drought. The Department held weekly briefings during the summer to inform the media and the public of the help available to farmers and rural communities from programs such as: feed and livestock assistance, weather-related hotlines, river-flow and river-traffic updates, disaster-relief legislation, and other measures. High-level policy officials chaired these sessions, and the Department's top weather analysts discussed the latest developments and forecasts.

It is difficult to adequately depict the true impact of the drought on rural and urban populations, water transportation systems, domestic livestock, forests, fish and wildlife, and crops. By early summer the drought had become so severe and extensive that well over 2,000 counties were eligible for emergency haying and grazing of acreage idled under long-term and annual Federal land retirement programs. In many cases, however, there was not significant forage on these lands to warrant harvesting.

The resources of virtually all USDA agencies and the Nation's land-grant universities were ready to help reduce the short- and long-term impacts of the drought. The following are examples of activities that took place to help rural and urban people:

- USDA and many State land-grant universities set up drought hotlines. These hotlines were staffed by specialists who helped people network into the land-grant system, linking those needing feed assistance with those having available feed, and accessing responsible officials at USDA. These hotlines helped people to feel more in control of their situation and to utilize all available resources.
- Agricultural engineers addressed issues relating to irrigation strategies, water supply problems of farms and towns, and animal care guidelines for periods of intense heat.
- Agricultural economists addressed financial and market issues pertaining to farm management, including strategies for dealing with rapidly rising grain prices, loan repayment problems of farmers who lost crops, and Government assistance programs.
- Plant physiologists and agronomists provided advice about critical plant development stages and about the ways in which water, fertilizer, and heat stress factors affect plant yields.

-
- Agronomists and soil scientists dealt with concerns about herbicide carryover and variety selection.
 - Animal scientists developed feeding and management strategies that dealt with such factors as: ammoniation of poor-quality roughages and nitrate poisoning from drought-stressed plants; feeding alternatives such as cattails; and culling procedures for livestock.
 - Entomologists developed environmentally sound recommendations for dealing with widespread problems caused by spider mites and other plant pests during the drought.
 - Public policy specialists prepared materials pertaining to water rights issues.
 - Rural sociologists and family development specialists developed programs to help families deal with the extreme stress caused by the drought.
 - Communication and information specialists assisted in the development of hot-lines; bulletins; and radio, television, and newspaper articles. Many State Extension offices produced their own newspapers, called drought tabloids, to ensure rapid dissemination of information generated by researchers and others. The USDA researched and published two major reports summarizing the effect of the drought on farmers and rural economies and actions taken by the Department to assist farmers during the drought.

Farming Systems Management*



American farmers operate in a global economy and environment characterized by fierce competition, widespread uncertainty, and an explosion of information. Systems approaches, now widely used in non-farm industries, are essential for addressing the complex and rapidly changing economic, environmental, and social conditions faced by farmers.

Farming Systems Management

Farming systems management focuses on improving farm productivity, enhancing rural incomes, and strengthening ties between production agriculture, rural economies, and supporting communities. It attempts to understand the web of decisionmaking within this interconnected system.

Farming systems management recognizes that (1) farm and off-farm income-generating enterprises compete with each other for inputs, and enterprises are linked through resource allocation decisions, (2) non-monetary household

* Material for this section was provided by Dixon Hubbard (coordinator), Extension Service, USDA; Jerry Eckert, Colorado State University; Claude Bonner, University of Arkansas; Allen Bjergo, Montana State University; Philip Rasmussen, Utah State University; Patrick Madden, coordinator of LISA field operations, Madden Associates; Gordon Niswender, Colorado State University; John Beverly, Texas A&M University; and Nick Stone, Virginia Polytechnic Institute and State University.

priorities influence farm operation decisions, and (3) farm households are enveloped by rural social communities, government policy and program matrices, agroclimatological environments, and overlapping networks of public and private institutional demands and services.

Because of the complexity involved, many land-grant universities are using computers and multidisciplinary teams to assist with farming system research and education.

- Colorado State University and the Agricultural Research Service (ARS) are developing expert systems that link farm management decisions with environmental management, irrigation system management, and agribusiness development.
- Agriculture systems management approaches using computerized decision aids were designed in seven States.
- The USDA Extension Service and Clemson University are developing a prototype for an information management-decision support system combining multimedia stand-alone stations with access to major databases.

Integrated Management

Integrated management approaches are narrower than farming systems. They focus on managing farm or ranch resources to sustain productivity and attain a projected level of profitability.

Integrated management programs are interdisciplinary, and they vary in resource team structure and approach. They may be specific to the whole farm or ranch, a commodity, or a task. These types of programs form the basis of the Integrated Resource Management (IRM) programming concept.

- The Texas Total Ranch Management (TRM) program prevented losses of more than \$200 million to cattle producers during the 1988 drought. Intensive training of ranchers in goal setting, resource assessment, enterprise identification, gross margin analysis, and enterprise combination and selection resulted in rescuing large, failing operations, increasing returns per acre by 50 percent or more, and helping to shift cattle ranches to other enterprises.

Commodity and task integrated management approaches are easier to manage, less costly, and are in wider use than whole farm or ranch approaches. Commodity integrated management focuses on economic performance in an individual animal species or crop. The interdisciplinary approach deals with many variables, including biological, technical, and economic.

- After 8 years of using intensive crop management systems, the Arkansas Cotton Research Verification Trials Program shows that total costs per pound of lint (excluding land, farm overhead, and management charges) were reduced from 57

cents in 1980 to 37 cents in 1988. Similar activities are underway in rice, soybeans, and wheat.

- Oklahoma's Alfalfa Integrated Management (AIM) program links animal science, HAYMARKET (an interdisciplinary marketing initiative), producer associations, extension personnel, and an integrated pest management (IPM) program. As a result, forage buyers receive a superior product, and growers gross \$12 more (and net \$4.50 more) per ton of alfalfa sold through the system.
- An evaluation of GOSSYM-COMAX, an expert cotton production system implemented by the Extension Service (ES), ARS, and Clemson and Mississippi State universities, showed that users net an additional \$40 per acre.
- Three universities developed decision support systems covering such topics as crop and pest management, soybean varieties, mix of crops, and purchase of crop insurance.
- Drought-affected farms in the Midwest were threatened by severe spider mite damage to soybeans. Through proper identification of beneficial and harmful mite populations, unnecessary applications of miticides were avoided. The result was an economic benefit of nearly \$250 million in cost savings, plus unmeasured but significant reductions in environmental contamination.
- Integrated beef cattle management program results showed an increase in net income of \$170 per beef cow in Colorado and an annual average increase in net income of \$1,919 per beef cattle herd in Iowa.
- Georgia's integrated swine management program reported a 63-percent increase in pigs weaned per sow per year, resulting in a 33-percent increase in net income.

Integrated management conserves inputs for soybeans. Data from the University of Missouri mail-in record program for soybeans (approximately 400 farmers) in 1986 showed input cost of \$117.50 per acre for the top one-third profit producers and \$142.65 per acre for the bottom one-third. Input costs for fertilizer and lime, pesticides, fuel and oil, and labor were \$1.60, \$1.70, \$8.15, and \$3.70, respectively, less for the top one-third profit producers.

Sustainable Agriculture

Sustainable agriculture is a further move towards comprehensive farming systems management and focuses on achieving balance among profitability, environmental soundness, and social acceptability of farming systems.

Congressionally mandated and funded programs involving USDA, land-grant universities, private firms, and farmers are encouraging program development in this area. More States are developing sustainable agriculture programs and increasing expenditures above the annual congressional appropriations.

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- Utah State and public agencies sponsored 20 sustainable agriculture seminars and 6 technology transfer research/demonstration plots. These plots showcase sustainable management systems that conserve energy, natural resources, and the ecology of the biosphere. Approximately 120,000 acres of Utah farmland are under some form of reduced tillage or sustainable management strategy, a 16-fold increase in 4 years.
 - In South Dakota, a whole-farm computer simulation based on crop-rotation experiments found that low-input systems have the potential to increase the profit of a typical size family farm (with 540 tillable acres) by up to \$30,000 under 1988 drought conditions.
 - California scientists are cooperating with vegetable farmers to determine why low-input farms have less plant disease and higher populations of beneficial species than chemical-intensive farms.
 - A New York crop management cooperative is working with farmers and Cornell University to promote rapid adoption of profitable low-input farming methods.

Forest and Rangeland Productivity*



Wise resource management requires periodic reevaluation of conditions and productivity, followed by adjustments in management strategies to meet projected demands. Scientists are responding to the challenge of increasing forest and rangeland productivity by developing techniques that enhance compatible production of multiple outputs and improve understanding of complex ecological issues. About 63 percent of the United States, 1.5 billion acres, is in forest and rangelands. As human populations increase, more demands will be placed on these lands. The continued development of new technology is imperative for increasing productivity. Productivity should be considered in the broad context of improving utilization, reducing losses from pests, protecting resources from catastrophic events, increasing growth, and diversifying outputs.

* Material for this section was prepared by Keith Evans (coordinator), Forest Service, USDA; Gary Simmons, Michigan State University; and Alan Ek, University of Minnesota.

Using Computers To Help Reduce Losses From Pests

Deciding how to prevent future pest damage or how to respond to a current pest problem in a forest is often complicated. Computers and the latest information can rapidly provide decisionmakers with alternatives and recommendations. An interdisciplinary team of USDA Forest Service (FS) scientists developed and computerized an integrated pest management decision guide based on the most current research recommendations from other FS and university scientists. Federal, State, and private landowners/managers use the computer program to help design management systems aimed at reducing losses from southern pine pests.

New Products and Processes

Research at several university and FS laboratories is helping the U.S. forest products industry remain competitive in today's global marketplace:

- University of Wisconsin-Madison scientists developed a wood-based material that can revolutionize the automobile industry and also provide a new market for wood. A nonwoven composite of wood and synthetic fibers is compression-molded at high temperatures to produce the desired shape. The composite is lighter in weight than current automobile skins and components and one-sixth as costly.
- Oregon State University scientists helped improve mill output by developing a method for evaluating veneer production. This led to development of new clipping strategies in veneer mills. Trials in Louisiana and Oregon increased veneer recovery 3 to 4 percent, resulting in \$200,000 to \$300,000 increases in annual revenue for each mill.

Improving Forest Growth Through Tissue Culture and Genetic Manipulation

Tissue culture and genetic manipulation are proving valuable tools in forest growth. Pilot plantings of hybrid aspens, important species for the pulp and paper industry in the Lake States, were established with seedlings and plantlets produced through tissue culture. Forest scientists in Minnesota also have tested 35 clones of quaking aspen for rapid growth and disease resistance and have conducted micropropagation research using the best clones. Improved micropropagation techniques, including tissue culture, are expected to speed the delivery of these fast-growing plant materials to public and private landowners.

A herbicide-resistant poplar clone developed by FS scientists is the first example of useful chemical tolerance induced in a forest tree species through genetic transformation. The next step is the construction of gene maps for major species. Such maps will provide the basis for genetic engineering of trees to produce specific growth, disease resistance, form, and wood fiber properties.

Parallel with these laboratory and screening efforts, researchers dramatically increased the number of seed orchards with genetically improved seeds. By the year 2000, virtually all of the seeds used in forest nurseries will be producing improved trees with increased growth rates of 5 to 20 percent.

The net effect of these developments will be higher yields and faster forest growth in the future. In some cases, faster tree growth will reduce the need for weed controls early in the life of the stand, thereby reducing management costs.

Evaluating Rangeland Productivity

The FS manages 167 million acres of rangeland and other forage-producing areas. Increasing demands for wildlife and livestock forage, water, timber, and recreation from these areas led to a cooperative research/management program to evaluate the production of range resources and the role of grazing. The three range evaluation projects (Southern, Oregon, and Great Basin) led to improvements in managing southern pine forests and western rangelands for forage production in concert with other products and values. Studies were conducted on herbage and browse production, water yield, wildlife, timber, recreational opportunities, improved production coefficients, and range improvement strategies. These evaluation projects serve as prototypes for future efforts and show how cooperation among Federal and State agencies, private landowners, and special interest groups can help ensure that a full range of natural resource and economic values are incorporated and integrated into resource management systems.

The Impact of International Trade on U.S. Agriculture*



Exports are critical to American agriculture. This fact became evident during the early 1980's as U.S. farm exports tumbled. The strong export orientation means that a great deal of American agricultural prosperity is tied to the development of an effective international marketing strategy. Such a strategy is clearly dependent on an improved understanding of (a) foreign markets and prospects, and (b) the nature of competition and competitiveness in the global marketplace.

Improved Understanding of Foreign Markets and Prospects

Several reports from the Economic Research Service (ERS) highlighted the potential growth in foreign market demand for agricultural commodities and value-added

* Material for this section was prepared by T. Kelley White (coordinator) and John Dunmore, Economic Research Service, USDA; Mary Carter, Agricultural Research Service, USDA; Wayne Sharp, Foreign Agricultural Service, USDA; and Clark Burbee, Cooperative State Research Service, USDA.

products. Trends in food preparation and consumption are changing rapidly in areas such as the Pacific Rim; in the reform-minded centrally planned economies; and in several high-income developing countries. Economic studies identified many of these emerging trends and patterns. A study on Japan, for example, highlighted the Westernization of diets in that country. More than ever before, prospective exporters need more detailed market information. Analyses of market trends and prospects allow food product exporters to be more competitive in terms of product development and positioning.

To sell products successfully in rapidly changing markets, an exporter needs the right product, properly presented. Procedures to improve handling, storing, grading, and shipping can assist trade. Agricultural Research Service (ARS) programs on freezing, dehydration, addback flavor, and essence recovery are making important contributions toward enhancing the ability to export frozen and dried fruit and vegetable products. This year, ARS researchers proved that methyl bromide treatment is effective against the codling moth. The benefit of this discovery is that the potential now exists for sales of fresh U.S. apples to the Japanese market.

Market prospects are affected not only by changing economic conditions, but also by changing agricultural and trade policy conditions in foreign countries. Studies document market access barriers and other policies of producer support and protection. These studies provide U.S. trade negotiators with important information for use in improving world trade conditions generally, and specifically in seeking the removal of trade barriers.

The developing countries, as a group, have been identified as a crucial element in the long-term growth of U.S. farm exports. Research on international macroeconomic issues, such as third-world debt, provided yet another perspective on the developing economies/farm export linkage. Several reports focused attention on the long-term implications of third-world debt on farm exports. Earlier work on the debt issue focused on the debt-affected country's ability to pay for farm products from the United States. Various export enhancement and credit programs were offered in an attempt to offset the short-term "ability to pay" constraint. The persistence of the debt problem, however, has led to slower growth in many of the debt-affected countries. This slower growth results from a fall in investment during this prolonged period of heavy debt repayment. Slower growth could translate into diminished demand for U.S. farm products. Such study results provide policymakers with an improved understanding of the "pass-through" effects of international macroeconomic phenomena on U.S. farm trade prospects.

The Nature of Competition and Competitiveness in the Global Marketplace

Both economic and policy factors were found to affect the competitiveness of a country's agriculture. An ERS study found that real economic variables, such as relative efficiencies and relative factor endowments (land, labor, and capital),

dominated export behavior. Government intervention that artificially supported domestic prices was found to be a very costly way to promote a country's exports. Government policies and programs, particularly monetary policies, were found to be a more dominant factor influencing import behavior. These study results add further evidence that attempting to forestall market forces is not only costly, but inefficient. One recent study calculated that for the industrialized countries as a whole, every dollar transferred to agricultural producers requires almost \$1.40 from consumers and taxpayers. In other words, for every dollar given up by consumers and taxpayers, only 72 cents actually reaches producers—the rest is an efficiency loss to the economy.

Research has shown that important added benefits can be gained by not only slashing the cost of current policies, but also reforming the policy/trade environment. Government interventions in agriculture have led to inefficiencies in resource use which, when corrected, could increase overall economic growth. ERS simulations of trade liberalization in 1986 indicate that there would be an overall benefit of \$33 billion. The European Economic Community would be the largest beneficiary, with more than \$12 billion in benefits. The United States and Japan also would realize substantial benefits of \$8.6 and \$6.3 billion, respectively. Studies that attempt to capture the long-term dynamic benefits of trade liberalization (not captured in the ERS simulations) estimate benefits as much as 3 times as large, or approximately \$100 billion—an amount equal to the gross national products of approximately half the nations of the world.

Enhancing Exports of U.S. Agricultural and Forest Products

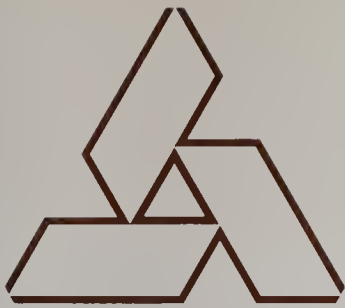
International Trade Development Centers for Agriculture (ITDC) completed a number of market research, educational, and promotional programs to enhance exports of agricultural and forest products and incomes of their producers. The centers are partially funded through grants to States to form partnerships between business, academia, and government in order to improve the competitiveness of U.S. small- and medium-sized firms in international markets. The centers serve regional needs and are primarily operated by land-grant colleges and universities located in nine States.

- IMPACT, the Washington State University center, completed market development projects that opened new multimillion-dollar markets in the Pacific Rim for live cattle and fruits and vegetables.
- CINTRAFOR, the University of Washington's forest products trade center, worked with IMPACT to complete on-site market assessment studies for wood products in the Pacific Rim and in other countries. Center teams are demonstrating new housing construction techniques that are having a positive effect on demand for U.S.-produced value-added forest products.
- MATRIC, the Iowa State University center, completed a major study of meat export market opportunities. MATRIC supports the development of meat products

for export and maintains a major international market trade data base for use by business and the research community.

- Mid-America World Trade, the Kansas State University program, focuses primarily on electronic market information transfer to provide trade leads to producers as well as to promote their products in foreign markets.





III. Accomplishments – Education and Technology

Biotechnology*



Advances in biotechnology can improve the quality and quantity of food and fiber, increase efficiency by regulating growth and development of animals, increase resistance to environmental stresses, diseases, and pests of plants, and provide more sensitive diagnostic tools and effective vaccines for animal diseases. The progress noted below can contribute to the Nation's ability to compete for international and domestic markets.**

Transgenic Animals

The goal of research with transgenic animals is to introduce economically important genes into livestock to improve production characteristics. Producers, whose sales total \$60 billion annually, and the public will benefit from animals that utilize feed more efficiently, grow faster, have increased resistance to disease, and produce less fat.

- USDA scientists in Michigan used genes from a virus to create transgenic chickens that produce an altered virus that makes them resistant to the disease caused by the original virus. The production of altered viral products by transgenic animals may be a general method of increasing disease resistance. This virus also may be used as a vector for producing transgenic "super chickens" that grow faster, produce more eggs, and are resistant to disease.

* Material for this section was provided by Harley Moon (coordinator), John Gorham, and Gerald G. Still, Agricultural Research Service, USDA; and Clarence Ryan, Washington State University.

**While this section identifies the significant progress of research on animals and plants, the next article discusses the development and implementation of curricula to prepare students for entry into fields requiring biotechnology expertise.

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- Auburn University researchers created transgenic fish with growth hormone genes. This offers the potential of raising fish more quickly, using less feed, and satisfying consumer demand.

Research on transgenic animals will help determine how genes affect growth and disease resistance and produce a better understanding of both animal and human health.

Selection of Resistant Animals

USDA researchers used monoclonal antibodies and recombinant DNA technology to demonstrate that one inbred line of swine was more resistant to trichinosis than another. Investigators at the University of California-Davis used similar procedures to show that bovine leukemia is associated with genetic markers on blood cells.

Although the investigations are in their infancy, these pioneering efforts will provide the techniques to identify individual animals and breeds that are more resistant to specific diseases.

Diagnostic Gene Probes

DNA or RNA sequences unique to microbes that cause some animal diseases have been identified. These sequences are in use as genetic probes and offer unprecedented specificity and sensitivity for diagnosing diseases.

Gene probes are particularly promising for diseases that are impractical to diagnose by conventional methods. USDA, Washington State University, and University of Florida researchers developed a DNA probe that is revolutionizing anaplasmosis investigations. The probe is 50 to 90 percent more effective than conventional tests in identifying carrier cattle. Deaths, abortions, and weight loss from anaplasmosis in cattle costs the United States more than \$100 million annually.

Bacteria that cause swine dysentery, leptospirosis, and Johne's disease of cattle are major causes of economic loss and animal suffering. Leptospirosis can also be transmitted from animals to people. All three of these diseases establish a carrier state in which apparently healthy animals perpetuate the disease by excreting bacteria. Detection of carriers is essential for control. Conventional methods for diagnosis are inadequate because the bacteria are particularly difficult to isolate. USDA investigators in Iowa, along with coworkers from the University of Wisconsin and the IDEXX Corporation in Maine developed gene probes for these three diseases. Probes reduce the time required for diagnosis from months to hours by testing urine or feces for minute quantities of the unique nucleotide sequences. These probes have inherently high sensitivity because they target repetitive genetic elements that occur as several thousand copies per bacterial cell.

Transgenic Plants

Plant genetic engineering techniques are being applied to facets of crop production—such as improving production efficiency, increasing market orientation, and enhancing environmental conservation—that traditionally have been dealt with through breeding and agrichemical approaches. Rapid progress has been made in the development of gene transfer technology for higher plants. More than 24 species of crop plants may now be routinely transformed. These new tools will complement plant breeding efforts by increasing the diversity of genes and germplasm available for use in traditional crops. The direct transformation and introduction of new genes into crops and the use of emerging methods to map genes will significantly shorten the time for production of new cultivars, varieties, and hybrids.

Engineering Tomatoes for Longer Shelf Life

Scientists at Calgene, Inc., in California, are using DNA technology to develop a tomato that softens more slowly than normal tomatoes and has a longer shelf life. Plants that produce the “non-softening” tomatoes have resulted from inserting a gene with reversed orientation into tomatoes. The presence of the softening gene and the new “antisense” gene produces “sense” and “antisense” messenger RNA’s. The two “hybridize,” or bind tightly together, blocking 90 percent of the production of the softening enzyme. This new gene is inherited permanently. The plants are being tested and studied to make sure the tomatoes have the same desirable traits as the vine-ripened tomatoes.

Researchers at the Plant Gene Expression Center in California are pursuing a similar technology to manage shelf life. They have isolated the gene that regulates ethylene synthesis in fruits. This offers opportunities to bioregulate the ripening process and to optimize product quality.

Engineering Plants With Enhanced Resistance to Insects

A Washington State University research team is using a gene from tomato and potato plants to control hornworm larvae on tobacco. The proteinase inhibitor gene, which produces a natural defense protein, was transferred from tomato and potato plants to the model plant, tobacco. The result was severely inhibited growth of tobacco hornworm larvae (*M. Sexia*), which grow vigorously on the leaves of normal, untransformed plants. The transformed plants process the messenger RNA’s and proteins to produce the potato and tomato proteins correctly in tobacco plants. Researchers have found the proteins and powerful inhibitors of the digestive proteinases in the guts of many of the insects that have fed on the transformed plants. When these proteins make up 1 to 4 percent of the total proteins in tobacco leaves, growth of larvae is reduced to 20 percent of that of larvae grown on control plants. The inhibitor genes are being incorporated into alfalfa to further test their defensive properties. The defensive characteristics of the plants against various insect pests is being studied to assess the full potential of the inhibitors in protecting plants against predators and pathogens.

Enhancing Agriscience and Business Expertise*



Agricultural curriculum review, change, and implementation must be an ongoing activity of the Nation's educational institutions if the U.S. food and fiber system is to maintain its position of leadership. Unprecedented changes are taking place in the agribusiness industry both at home and abroad. Similarly, genetic engineering, one of the four major scientific revolutions of the century, gives indications of altering the face of world agriculture. Thus, the Nation needs more and better educated young scientists, specializing in agriculture, who understand how to exploit genetic engineering to enhance the domestic production of food and fiber.

Biotechnology Undergraduate Education

Several approaches have been developed to train agriscientists for entry into fields requiring expertise in biotechnology.

- Cook College at Rutgers University and the University of Wisconsin-River Falls developed baccalaureate programs in biotechnology that include courses in classical and molecular genetics, biochemistry, and other courses designed specifically for the new major.
- North Carolina State University, the University of Wisconsin-Madison, and the University of California have chosen not to treat biotechnology as a separate discipline,

* Material for this section was prepared by Joseph Kunsman (coordinator), University of Wyoming; Keith Wharton, University of Minnesota; Edward E. Darrow, The Ohio State University; Gordon Niswender, Colorado State University; Deborah Silva, University of California, Riverside; and Billy Hooper, Association of American Veterinary Colleges.

but to integrate biotechnology training into recognized academic disciplines at the undergraduate level.

- Texas A&M University initiated a degree program in genetics to provide students the education and laboratory expertise in molecular biology necessary for future careers in biotechnology.

Biotechnology Graduate Education

There is a growing need for agricultural scientists trained not only in the laboratory techniques of biotechnology but also in the methods for evaluating its impact on the environment. Graduate seminars focusing on the ecological impact of agricultural biotechnology were developed at the University of California, Riverside. The seminars address major risk assessment policy issues such as the ecological consequences of the release of engineered plants and microorganisms. A key role for these graduates is to articulate to the general public biotechnology and its inherent economic and social advantages.

Interdisciplinary graduate programs in genetics train agricultural scientists to integrate concepts from molecular genetics, population-quantitative genetics, and biotechnology for solving problems in novel ways. These programs encourage systematic thinking across disciplines by emphasizing the basic unity of genetic principles at all levels of organization. Colorado State, Georgia, Texas A&M, and California are among the universities offering such programs.

North Carolina State University's approach is to award a minor in biotechnology with a major in a recognized academic discipline.

Veterinary Medical Education

Redirection of veterinary medical education has become a top priority of the veterinary medical profession in North America. Supported by a \$5.5 million grant from Pew Charitable Trusts, the veterinary industry identified more than 40 major environmental changes affecting U.S. society, agriculture, and veterinary medicine. Efforts focusing on the veterinary medical colleges and the educational process include: (1) emphasizing general education and principles for biomedical science within the context of "information storage, retrieval and management", (2) strengthening the use of group learning and shared responsibility in problem solving, (3) providing increased depth of education, (4) increasing interinstitutional cooperation to take advantage of unique strengths of specific institutions, and (5) providing for more research and education in the economics of animal health care delivery systems.

Agribusiness Education

Under the aegis of the U.S. Department of Agriculture's office of Higher Education Programs, the Agribusiness Education Development Project was initiated. Subsequently,

the Lincoln Institute of Land Policy received a USDA grant to coordinate and develop guidelines for innovative agribusiness management programs, strategies for continuing education, and executive development. The result was a model master's program that combines the common body of knowledge of MBA programs with courses in agribusiness management. The common body of business knowledge encompasses the study of concepts, processes, and institutions involved in the production or marketing of goods and services, and the financing of business enterprises. Economic, legal, ethical, and political influences are considered as they pertain to profit organizations. The agribusiness management component deals specifically with policies and regulations affecting the agricultural business environment. Imaginative public information and recruitment campaigns, coupled with industry cooperation in securing job placement for graduates, are planned to attract more highly qualified people into these programs.

Agriscience Literacy Among High School Students

National concern about the scientific literacy of American students continues. This concern prompted the development of a Science Workbook at Ohio State University to encourage the active involvement of students in agriscience. After national dissemination of the first workbook, another was developed to emphasize organic chemistry, biochemistry, and their relationship to biology and agriscience. The second Science Workbook, *Student Research Projects in Food Science, Food Technology, and Nutrition* was distributed nationally and is found in many high school science laboratories and classrooms, where teachers illustrate the practical application of basic science principles using a variety of foods and nutrition principles.

Challenges of 21st Century Education

Colleges of agriculture must give increasing attention to curriculum revision and revitalization if their graduates are to be prepared to meet the challenges of the 21st century. Project INTERACT, supported by a grant from the USDA's office of Higher Education Programs, is designed to give national leadership and encouragement to these local efforts. Outstanding professionals from industry, government, and education meet to clarify the central issues and needs for future curriculum development and recommend action plans for addressing them.

Innovations in Information Management and Transfer*



Computers, optical character readers, text digitizers, laser discs, and high-speed telecommunications are among the means the National Agricultural Library (NAL) uses to carry out its mission of providing information to the U.S. Department of Agriculture and other constituents in agriculture. Before implementing these technologies, NAL often evaluates their effectiveness for managing, preserving, accessing, and disseminating information. Three information technologies show progress or completion for fiscal year 1989:

Expert Advisory Systems

Since 1986, NAL has explored the utility of expert advisory systems that serve as directional tools to selected literature and resources on aquaculture, food and nutrition, herbs, and online search strategies.

- Two prototype systems developed earlier, AquaRef (aquaculture) and FNICAID (food and nutrition), identify information such as book titles, journal articles, pamphlets, and/or audiovisual materials appropriate to the topic. FNICAID also provides specific data such as food sources of calcium. These advisory systems relieve the professional librarians and other information specialists from answering routine questions.
- REGIS (REGional Information System for African Aquaculture), a cooperative effort between NAL and the Food and Agriculture Organization of the United Nations, was

* Material for this section was prepared by Robert Butler (coordinator), Pamela Andre, Deborah T. Hanfman, Maria Pisa, Karl Schneider, and Judi Zidar of the National Agricultural Library, USDA.

completed in 1989. The prototype merges hypermedia and expert systems technologies to provide users access to the entire text of selected documents on African aquaculture. REGIS demonstrates a new approach to consolidating a body of literature and information into a single system that is accessible on a microcomputer.

Digitized Text for Access to and Preservation of Agricultural Literature

The National Agricultural Text Digitizing Project (NATDP) is a cooperative venture with 44 land-grant university libraries. It was established to test the feasibility of using optical scanning and character recognition technology for the capture, in computer-readable form, of printed agricultural publications. This electronic information can then be placed on compact discs (CD-ROM) for distribution to libraries in the United States and other countries. NATDP projects and results include:

- *Aquaculture I*, a pilot CD-ROM, contains text and page images of 62 reference works on U.S. aquaculture and provides the user with full-text access. The first of its kind, it was produced and distributed to participating land-grant universities and is being evaluated for content and ease of retrieval.
- *Food, Agriculture, and Science*, a disc on international agriculture with text and instructions in French, Spanish, and English, was developed jointly with the Consultative Group on International Agricultural Research (CGIAR).
- Agent Orange and Canadian acid rain discs are scheduled for distribution early in 1990.

This technology is used to take information that resides at a single site, preserve it on a hardy, reliable medium, and make it easily accessible to the agricultural community at large. NAL is conducting a statistical analysis of the factors affecting optical character recognition accuracy. This information, plus the results of the CD-ROM evaluations, will be shared with the agricultural and technology communities.

Electronic Bulletin Board

An electronic bulletin board system called "ALF" (Agricultural Library Forum) began its second year of operation. It provides remote, around-the-clock access to information sources, services, programs, activities, and assistance pertaining to agricultural interests.

Conferences focusing on 11 different topics have been set up on ALF to allow special interest groups to communicate with each other electronically. Some conferences target broad audiences such as the library community. Others are: (1) subject-specific (e.g. biotechnology, groundwater, and alternative agricultural opportunities), (2) targeted to USDA and other agencies working on related projects, and (3) often involve interagency communications.

NAL reference tools, information releases, expert advisory systems, and nearly 150 other files can now be downloaded immediately by the user. In less than 2 years of operation, ALF has logged more than 6,000 incoming calls.

NAL's capabilities in coordinating agricultural information access and services are greatly facilitated by the high-speed messaging capabilities of the bulletin board. Projects using ALF to add speed, efficiency, and networked (multi-directional) access continue to be developed.

New Technologies for Training*



Innovative technologies permeate the field of education and training. The merger of the computer with the laser videodisc has resulted in an effective means for instruction. Public and private sectors, especially Federal agencies with substantial training needs, are increasing their investments in computer-based interactive video systems. Both the National Agricultural Library (NAL) and the Cooperative Extension System are developing technologies to implement cost-effective training and instruction programs for the U.S. Department of Agriculture, land-grant universities, and the general public.

Interactive Instruction for Database Searching

The National Agricultural Library introduced AGRICOLearn, an instructional package combining text and graphics in a computer with moving pictures and sound on a videodisc. The disc provides instruction on how to search NAL's AGRICOLA database and similar databases. Designed for online systems, but applicable also to CD-ROM, the user-friendly instructional tool assists students with learning searching basics or studying in-depth search strategies.

The technology permits flexibility. In contrast to the instructor-led, 3-day course held primarily at NAL, the videodisc program offers agricultural researchers, faculty, librarians, and students training at a time, pace, and location convenient to them.

* Material for this section was provided by Robert Butler (coordinator), National Agricultural Library, USDA; and Thomas G. Tate, Extension Service, USDA.

AGRICOLearn invites participation by involving the student in identifying and choosing responses and by providing feedback. Interactive systems such as this have proven effective for learning.

The AGRICOLearn package is free to USDA and land-grant universities that provide the equipment. Alabama, Florida, Iowa, Michigan, and California land-grant universities, the Nova Scotia Agricultural College, and the Agricultural Research Service field libraries used the system in 1989.

Public Information Systems

State Cooperative Extension Services launched new public information systems that provide multi-media information on food and agricultural science topics in places and at times convenient to the general public.

The need to increase accessibility of USDA and land-grant university information and education programs led the Extension System to explore new outreach channels.

- Seven States used kiosks to recruit students for land-grant university resident instruction and participants for extension adult and 4-H youth programs. Potential students and program participants view brief video demonstrations and print out instructions on how to enroll.
- The Wisconsin disc on horticulture provided extension assistance at a garden center, where it helped customers identify insects and diseases affecting their shrubbery.
- Virginia Tech and New Mexico shared program development expertise on discs featuring human nutrition, pest management, and financial management, while Maine launched a kiosk program on radon with shared resources from Maryland and Ohio. This resulted in training being delivered at a fraction of the cost of single-State efforts.
- Pesticide applicator training was conducted by interactive video in Minnesota and Virginia, while Texas and California used the technology for training on cotton pest management.
- Fort Valley College in Georgia developed a Mobile Learning Center to help local decisionmakers understand new approaches and new technologies, and to help them plan cost-effective implementation in the local community.
- The Extension Video Network manages a national inventory of videotapes for use by extension staff and their clientele. Millions of farm and home video cassette players are now remote extension learning centers.
- Videoconferences on agricultural alternatives, biotechnology, and communications technology originated from seven land-grant universities and USDA. Hundreds of county downlink sites offer live interaction for training of local clients by national experts.

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- CD-ROM's were developed in three States, permitting training materials and other publications to be stored and printed upon request at local extension offices. Benefits include improved accessibility to information.
 - CESNET (Cooperative Extension Systems Network) offers new training opportunities to State extension staff via computer conferencing, bulletin boards, and electronic messaging. CESNET redirected extension from mainframe to microcomputers, substantially reducing costs.
 - A new FAX network accelerates the transfer of urgent information such as the President's Food Safety Plan to State extension offices nationwide.

Recruitment and Retention of Students in Agriculture*



Major accomplishments in food, agricultural, and natural resource higher education programs are highlighted by successful national career education programs, achievements of outstanding graduate fellows, and a national assessment of student retention.

Career Education

"Energize the Green Machine," a national campaign to increase career awareness, introduced a new agricultural and natural resource careers booklet in Spanish to reach more minority students. Other new thrusts from the Food and Agricultural Careers for Tomorrow (FACT) project, a cooperative effort of the U.S. Department of Agriculture and Purdue University, included:

* Material for this section was provided by Allan D. Goecker (coordinator), Purdue University; Gerald W. Brown, Northwest Missouri State University; and K. Jane Coulter, Cooperative State Research Service, USDA.

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- Development of career education exhibits. These exhibits are being used by educational institutions and agencies at regional and national events to emphasize excellent career opportunities.
 - Development and national distribution of a new series of career information leaflets and placemats using the theme, "100 Paths to Success." One hundred different food, agricultural, and natural resource professional opportunities are presented. To emphasize the international dimension, a nine-language career poster, "You Can Be Successful in the Food, Agricultural, and Natural Resource System," was developed and distributed in cooperation with U.S. colleges and universities.

A national interactive teleconference, "Food For The Future," attracted an estimated 5 million viewers in grades 6 to 12 in February 1989. Today's agriscience was featured with its vision of future developments in biotechnology, space agriculture, hydroponics, and aquaculture. Hosted by the USDA Higher Education Programs office, the University of Florida, Kraft, Inc., and the Louisiana Educational Satellite Network (LESN), the telecast originated from "The Land" at Walt Disney World's EPCOT Center and LESN.

Outstanding Graduate Fellows

A national symposium, "Future Opportunities and Challenges Unique to Science" (FOCUS), was held in Washington, D.C., to honor the first graduates of the USDA National Needs Graduate Fellowships Program. The fellows displayed significant products of their research and education activities and interacted with high-ranking senior executives from the public and private sectors, congressional staff, university administrators and faculty, and industrial leaders.

More than 400 academically outstanding graduate fellows have been recruited through this program and are assuming key research and education positions in government, academia, and industry as they complete their advanced degrees. These men and women bring great promise and special talents to the food, agricultural, and natural resource system from their interests in biotechnology, food science, human nutrition, marketing, engineering, and water sciences.

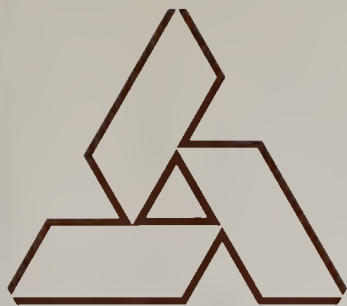
Student Retention Assessment

The shortfall of qualified graduates in the food and agricultural sciences could be eased through improved student retention. Therefore, Northwest Missouri State University, via a cooperative project with the USDA, has compiled baseline retention data. These data are helping colleges and universities to evaluate their retention programs from the perspectives of student academic preparation, ethnicity, socioeconomic status, and academic performance.

Case studies of model programs have been highlighted in a summary report distributed nationally. A national symposium on agricultural and natural resource undergraduate student attrition and retention brought together representatives from the American

Association of State Colleges of Agriculture and Renewable Resources, National Association of State Universities and Land-Grant Colleges, and National Association of Professional Forestry Schools and Colleges. The symposium helped the institutions map strategies to improve the retention of students in their respective programs.





IV. Accomplishments – Environment and Natural Resources

Conservation Reserve Program*



The 1985 Food Security Act (FSA) provided some of the most far-reaching changes in soil and water conservation programs since the 1930's. The Act signaled a significant change in commitment to protecting soil and water resources. In order to receive USDA program benefits, farmers must begin implementing conservation farming practices on highly erodible land and avoid draining wetlands. Major conservation provisions of the FSA included the Conservation Reserve Program (CRP), Sodbuster, Swampbuster, and Conservation Compliance. Benefits expected from the conservation provisions include reduction in soil erosion, better income stability for CRP participants, enhanced wildlife habitat, increased timber production potential, and improved water quality.

The Conservation Reserve Program, a major element of the Act, was designed to take a large acreage of highly erodible cropland out of production for a 10-year period. Cropland enrolled in the program is placed under more permanent cover to lower erosion rates and to reduce Federal outlays for commodity payments. Cover practices applied with technical assistance from the Soil Conservation Service and the Forest Service and financial assistance from the Agricultural Stabilization and Conservation Service (ASCS) include introduced and native grasses, vegetated waterways and filter strips, and wildlife ponds, plantings, and food plots.

New cooperative efforts extended outside of USDA as agencies consulted with the Environmental Protection Agency (EPA) on water quality issues and with the U.S.

* Material for this section was prepared by Dwight Treadway (coordinator) and Fred Deneke, Extension Service, USDA; Jim McMullen, Agricultural Stabilization and Conservation Service, USDA; R. Darrell Baker, Agriculture Science Center at Clovis, New Mexico State University; and John Gunter, University of Georgia.

Fish and Wildlife Service on wetland protection and wildlife matters. Support also came from private conservation organizations.

Soil Erosion Reduction

Nationwide, the average soil erosion rate on land in the program is estimated to be reduced from 21.5 tons per acre to 1.6 tons after permanent vegetation is established.

Water Quality Improvement

Permanent vegetative cover reduces the quantity of agricultural pollutants that cause impairments to bodies of water. Therefore, streams, lakes, estuaries, reservoirs, and wetlands currently impaired by pollutants from highly erodible cropland are expected to show improvement where CRP enrollment is high. Improvements in water quality may take a few years to materialize following large reductions in sediment, nutrients, and pesticides.

Tree cover is known to reduce erosion rates on land formerly cropped. Furthermore, studies indicate that more than 90 percent of trees planted will remain past the contract period, which will result in long-term water quality improvement. With the encouragement of EPA, land to be placed in filter strips was made eligible for CRP—regardless of erodibility—and bid pools (as defined by the State ASCS committee) were realigned to boost enrollment in targeted areas, such as in the Chesapeake Bay watershed.

Wildlife Benefits

Wildlife biologists generally agree that the CRP-related cover improvement is beneficial to wildlife. Habitat requirements differ, but specialists agree that most farm wildlife—upland game, ground-nesting birds, small mammals—and related grassland-dwelling species will clearly benefit from the program.

- The U.S. Fish and Wildlife Service has been a close partner in the cropped wetlands initiative, and in wetland protection and restoration in general. The Service has undertaken a major restoration effort on lands affected by the Food Security Act. Last year, more than 15,000 acres of prairie potholes, bottomland hardwood forests, and other wetlands were restored in the Midwest, Northern Plains, and Southeast.
- Six States offer CRP piggyback programs to supplement Federal programs. Financial incentives range from paying an additional \$20 per acre per year to a one-time bonus of \$50 per acre for grass and \$100 per acre for the cover filter strips. These and other examples demonstrate the results of cooperation and conservation, and lay the foundation for future interaction to enhance natural resources throughout the United States.

Curbing Surplus Commodities

The retirement of commodity-base acreage under the CRP has reduced the production of program crops, such as corn, sorghum, wheat, barley, oats, and cotton. The largest amounts of base acreage enrolled in the CRP are located in the Corn Belt, Northern Plains, Southern Plains, and Mountain regions.

Policy Implications

Initial research studies show the CRP to be a relatively successful program. As of August 1989, producers had temporarily retired 35 million acres. However, farmer surveys have found that more than 80 percent of the participants will place CRP lands back into production when the contract period ends. New approaches are needed to ensure continued participation in the CRP or similar crop retirement programs.

To minimize potential economic slowdowns in rural communities, no more than 25 percent of a county may be enrolled in the CRP. However, reduced agribusiness activities have been reported in some counties. Future policies should consider environmental goals in conjunction with economic and rural development objectives.

Policy tools developed in the 1980's may become less effective in the 1990's if high market prices remove incentives for complying with the Food Security Act of 1985 or if crop subsidies are reduced. Research has shown that future crop retirement programs exceeding 45 million acres could lead to extreme price fluctuations, since normal inventories might be inadequate.

Improved Practices To Enhance the Environment*



The American public is concerned that food, water, and air are contaminated with organic chemicals and that American agriculture contributes to this situation. This concern is being translated into regulatory constraints on the agricultural producer. American agriculture must remain competitive both in this country and worldwide. Consequently, it is critical that agricultural science and education continue to assure that crops are produced in an environmentally sound manner, and that effective, environmentally suitable methods be used to purge toxic or offensive organic products from the environment. The USDA and the land-grant university research system have made significant advancements in both of these areas of concern.

Biological Control of Pests and Diseases

Natural predators, parasites, pathogens, and competitors have been used successfully for biological control of insect and mite pests, weeds, and plant pathogens.

* Material for this section was provided by James R. Cate (coordinator), Texas A&M University; Philip C. Kearney, Agricultural Research Service, USDA; Nancy Ragsdale, University of Maryland; George Templeton, University of Arkansas; Merritt Nelson, University of Arizona; and Kirk Brown, Texas A&M University.

More than 400 U.S. scientists and educators are working on biological control. Their work has led to major gains in production efficiency and profits and in the reduction in use of pesticides on farms, forests, and urban landscapes. Recent examples include the following:

- Exotic natural enemies, established over the past decade, are controlling 17 species of insect and mite pests and weeds. Cropping systems for which control was achieved include: alfalfa, citrus, ornamentals and shade trees, guava, almond, coconut, avocado, and three species of aquatic weeds. *Culex* and *Anopheles* mosquitoes also are being controlled.
- Arkansas scientists developed mycoherbicides from commercially formulated native microbial pathogens of weeds. Commercial products developed from these beneficial plant pathogens now control northern jointvetch, milkweed vine, sick-lepod, coffee senna, round-leaved mallow, dodder, and velvetleaf.
- Successful biological control of plant pathogens with beneficial microorganisms includes: a fungus to control a seedling disease of pine, a bacterium to control a bacterial infection of nursery and woody plants, a mutant of the tobacco mosaic virus (TMV) to control this virulent virus in greenhouse tomato production, and a mildly virulent strain of Tristeza virus (TV) to control TV in citrus.

Enhanced Biological Detoxification of Offensive Chemicals in the Environment

The USDA and land-grant university research partnership made great strides in developing methodology for biological enhancement of degradative processes of organic chemicals used in agriculture and industry. Some illustrations of biological detoxification efforts to enhance water quality are described later in this section under "Water Quality." Other significant advancements include the following:

- Studies on the effect of tillage and straw mulches on residues of two herbicides, alachlor and linuron, in double-cropped soybeans showed that tillage had no effect, but straw mulches served to intercept the herbicides by absorbing them and slowing their movement into the soil. The mulches served to reduce residues and provide more effective control of weeds.
- Better understanding of how pesticides applied to foliage affect human harvesters was gained by correlations of foliar levels, soil residue levels, and subsequent levels in human subjects exposed to chlorobenzilate. Such correlative models improve safety for farm workers in fruit and vegetable crops.
- Rapid degradation of small quantities of diazinon was achieved by composting in manure/peat. Composter design and appropriate methodology for safe use by consumers and commercial applicators is being developed.
- Certain fungi and bacteria were found to be associated with accelerated degradation of a fungicide, metalaxyl, in soils of avocado orchards in California.

-
- Rectangular above-ground tanks containing soil that supports populations of pesticide-degrading microorganisms were designed and used in Texas as inexpensive, safe, and approved "soil digesters" to degrade rinsate and other dilute pesticide-contaminated waste water generated in areas where pesticides are mixed or used.
 - A simple system using ozone and microbial metabolism was devised to destroy atrazine in waste water from pesticide spray tanks.
 - A group of microorganisms was isolated and shown to be effective in metabolizing coumaphos, the major insecticide used in cattle dipping operations.



Public concern for the effect of human activities on the quality of the Nation's water resources has been structured into policy and legislative initiatives at national and State levels for more than two decades. Major environmental benefits have been realized in response to these initiatives through the combined efforts of farmers, ranchers, foresters, industry, and public-sector agencies and institutions.

Simulation Models

Sediment from soil erosion is the major contaminant of surface water in forest lands and rangelands. Eroded soil is also a major contributor to surface water degradation in croplands. Several erosion, water quality, and risk analysis models have been developed to help resource managers, conservation planners, and others determine the cumulative effects of multiple land use and land management activities on sediment releases to streams, lakes, and estuaries. Chemicals Runoff and Erosion from Agricultural Management Systems (CREAMS), Agricultural Nonpoint Source (AGNPS), and Water Erosion Product Project (WEPP) are outstanding examples of recent developments in natural resource modeling.

North Carolina State University and Agricultural Research Service (ARS) researchers demonstrated that controlled drainage reduces nitrate releases from drained areas by as much as 50 percent. Water table management, implemented on more than 150,000 acres of cropland, reduced the nitrate loading of receiving

* Material for this section was provided by David A. Farrell (coordinator), Agricultural Research Service, USDA; Wayne Skaggs and Thomas Carter, North Carolina State University; Roy C. Sidle, Forest Service, USDA; Charles M. Smith, Cooperative State Research Service, USDA; Ronald Athanas, University of Massachusetts; Fred Swader, Extension Service, USDA; and Richard Ferguson, University of Nebraska-Lincoln.

waters by more than one million pounds annually. Farmers in four other States are adopting the DRAINMOD simulated water table control system because of its proven economic and environmental benefits.

Environmental Legislation

State and Federal researchers in North Carolina, Georgia, Maryland, and Pennsylvania showed conclusively that riparian zones can reduce the loading of streams by sediments and essential plant nutrients by 75 to 95 percent. Environmental legislation enacted recently by Virginia specifically recognizes the water quality benefits derived from riparian zone protection and management.

Herbicides

Controlled-release herbicides, using natural cereal starches, have received considerable national and international attention. This innovation, reported earlier, has the potential to reduce the risk of herbicide leaching for hundreds of millions of acres of cropland. ARS has developed a new weed management strategy based on a bioeconomic model for determining herbicide application rates.

Soil Nitrogen Test

A soil nitrogen test was developed at the University of Vermont to improve nitrogen management on the State's dairy farms.

- Basing fertilizer applications on this test, which measures the nitrate content of the upper centimeters of the soil profile in late spring, reduces the risk of over-application of nitrogen fertilizers and subsequent contamination of surface water and groundwater by dairy operations.
- Cooperative Extension in Vermont conducted programs to increase the farmer adoption of this test and to convert it into a management tool. Connecticut, Pennsylvania, and Iowa conducted complementary research on the soil test and indicate that it may be widely applicable.

Best Management Practices

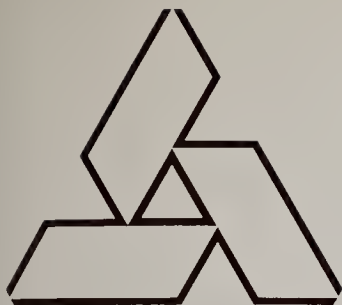
In Nebraska, parts of the central Platte River valley, with sandy soils and intensive irrigated corn production, have a history of high concentrations of nitrate in groundwater. Since 1985, an educational program utilizing demonstration plots has been conducted by the Nebraska Cooperative Extension Service in cooperation with local and State agencies. Producer adoption of nitrogen and irrigation best management practices (BMP's) is greater in the program counties than in counties where the program was not conducted. More than half of the producers in the program counties are testing deep subsoil samples for residual nitrate and irrigation water for nitrate content. By using the recommended BMP's, farmers in each of the program counties are saving an estimated \$300,000 or more annually.

Utilization of Wastes

Extension Services across the Nation conducted programs that focused on proper utilization of animal wastes and emphasized the application of nutrients consistent with crop, soil, and environmental needs. Waste samplings used to determine correct waste utilization rates increased by 50 percent in some States. Three States each reported a total annual sample number of over 1,200. Pilot systems that integrate environmentally sound utilization of wastes from confined hog and poultry facilities with intensive cattle grazing resulted from Extension programming in North Carolina.

The development of fish hydrolysate as a fertilizer, and its adoption by cranberry growers in southeastern Massachusetts, transformed an expensive processing cost into valuable raw materials, reduced the application of inorganic fertilizer materials on cranberry bogs, and increased cranberry yields. Fish "frames" (fish bodies with the commercial fillets removed) were previously a disposal problem. This \$40-per-ton disposal problem is now a raw material worth \$20 per ton for conversion to fish hydrolysate. Fertilizer distributors and producers marketed an estimated 50,000 gallons in 1989, and demand currently exceeds production. The University of Massachusetts Cooperative Extension Service, the Gloucester Marine Station's Fisheries Association, the New England Fisheries Development Association, and the Northeast Fisheries Center Gloucester Laboratory of the National Marine Fisheries Service collaborated to test the feasibility of using fish hydrolysate as a substitute for inorganic fertilizers, and to assist cranberry growers in applying it in a non-intrusive manner.





V. Accomplishments – Food, Diet, and Health Relationships

Diet, Human Nutrition, and Health Relationships*



Agricultural Research Service (ARS) and land-grant university scientists continue to improve the understanding of how diet affects health. The Cooperative Extension System provides the nationwide educational network that links the research to the needs of the people where they live and work.

Updating Composition of Foods

Maintaining reliable information about the nutrient composition of foods continues as new analytical methods are developed, concerns arise, and modified foods appear in the marketplace. The USDA's food composition tables are the main source of nutrient data on American foods. ARS and other scientists do the analyses of foods used for the nutrient data bank. Scientists recently: (1) found that large (50 gram) eggs contain an average of 213 milligrams of cholesterol—23 percent less than was previously reported, (2) used copper values from direct analyses and from published articles to develop a list

* Material for this section was provided by Carolyn Berdanier (coordinator), University of Georgia; Gerald Combs, Agricultural Research Service, USDA; Wells Willis, Extension Service, USDA; and George Mountney, Cooperative State Research Service, USDA.

of 218 major contributing food sources, (3) improved a method to determine total dietary fiber, and (4) demonstrated that calculated values for total dietary cholesterol usually exceed by one-third those obtained by direct analysis.

Energy Needs During Infancy and Lactation

Controversy persists about the adequacy of human milk as the sole source of energy for infants after the first few months of life. Scientists demonstrated that:

- Breast-fed and formula-fed 1-month-old infants consumed similar amounts of energy, but 4-month-old formula-fed infants consumed substantially more energy and were somewhat heavier than human milk-fed infants of the same age.
- Zinc absorption was 25 percent greater from breast milk than from infant formula, but absorption of copper was the same.
- Fortified mother's milk provides a better diet for low-birth-weight infants than standard infant formulas made from cow's milk.
- Mothers consuming low-fat diets produce milk only slightly lower in total fat content.

Lowering Dietary Risk Factors for Coronary Heart Disease

Coronary heart disease (CHD) is still the most common cause of death in the United States, with more than 1.25 million heart attacks annually. Researchers demonstrated that:

- Low-fat diets containing low-fat milk and lean meats trimmed of separable fat did not increase the risk factors associated with CHD.
- The degree of inhibition of arachidonic acid metabolism in rats appears to be influenced by the ratio of omega-3/omega-6 fatty acids, rather than the absolute amounts. Arachidonic acid is an essential fatty acid in human diets.
- In women, reduction of dietary fat from 40 percent to 20 percent of the calories resulted in changes in fatty acid composition of lipoprotein, phospholipid, and cholesterol esters.
- Increasing the dietary linolenic acid, a polyunsaturated acid, in place of a monounsaturated fatty acid (oleic), while keeping total dietary fat and saturated fatty acids constant, resulted in prolonged clotting time.
- Male volunteers were fed high- and low-fat diets with different proportions of the fat supplied as linoleic acid, an omega-6 polyunsaturated fatty acid. Diets containing relatively high amounts of this fatty acid resulted in increased production of prostaglandin E₂, a biologically potent regulatory substance that influences myocardial and coronary circulation and contributes to regulation of blood pressure.

Calorie Restrictions

Research conducted at Georgia over the past 10 years shows that intermittent starvation or caloric restriction results in an increase in the ability of the body to synthesize fat. These results can explain why people who diet to lose weight regain the lost weight, and more, when they return to their normal eating patterns.

Nutritional Needs of the Elderly

Studies indicate that the recommended dietary allowance for Vitamin D of 200 International Units daily is too low for the elderly, especially in northern States during the winter months. Research with post-menopausal women reconfirmed that boron is involved in mineral metabolism: it increases the retention of calcium, phosphorus, and magnesium by reducing urinary loss. An inquiry involving aging individuals with and without cataracts determined that blood levels of Vitamins C, D, and carotene were significantly higher in persons without cataracts. Finally, it was found that sugars and other foods that increase insulin levels lead to increased urinary losses of chromium, which is associated with insulin function.

Nutritional Status

Developing methods for measuring nutrient concentrations and relating this information to long-term health factors is important to the well-being of the Nation's population. Research results include:

- Isotope dilution techniques developed at Iowa to assess total body stores of Vitamin A.
- An automated method of determining marginal or severe vitamin B-6 deficiency by measuring levels of B-6 dependent enzymes.
- The total body electrical conductivity method (TOBEC) is an improved way to measure the body's fat-free mass in individuals between 35 and 90 years old. Unlike previous tests, the TOBEC method is not affected by changes in bone mineral content.

Nutrition Education

During 1989, the Cooperative Extension System's nutrition, diet, and health programs educated participants about recommended lifestyle patterns, including dietary practices, appropriate for their age, sex, and stage of life.

- Through direct contacts, mass media, and other outreach efforts, 21 States and 2 territories reached more than 1.8 million adults and youth with nutrition, diet, and health programs.
- Impact data from 19 States indicate that Extension programs led to improved dietary patterns for more than 350,000 people.

Expanded Food and Nutrition Education Program*



American children are one of the Nation's greatest assets and comprise the largest and most impoverished age group. Unfortunately, this group is affected by high infant mortality rates, low birth weights, lack of access to nutrition programs, and malnutrition. Children born under these conditions often do not fully develop physically, mentally, or emotionally. Many low-birth-weight infants require life-long custodial care, including health care and special education for those severely impaired.

The Cooperative Extension System's Expanded Food and Nutrition Education Program (EFNEP) helps to alleviate these problems by teaching adults and youth to plan, select, and prepare economical and nutritious food to meet their daily needs. Managing financial resources, including food stamps, and increasing understanding of the essentials of good nutrition throughout the life cycle are also important elements of the intervention program.

Educational Outreach

Almost 37 million individuals in the United States live in poverty. Last year, EFNEP enrolled 546,000 persons (177,000 families and 369,000 youth) in 790 sites in the poorest counties. More than 394,000 additional family members received benefits as a result of other adult participants. Seventy-six percent of EFNEP participants had an annual income below \$8,800; 52 percent of those were at or below \$5,250.

* Material for this section was provided by Nancy B. Leidenfrost (coordinator), Extension Service, USDA; and Margaret Randall, University of Massachusetts.

Sixty-two percent of adult participants and fifty percent of the youth are minorities. Hispanics and Asians make up 25 percent of the adult enrollment. An inventory of non-English-language EFNEP material was made this year and provided to States to facilitate their work.

EFNEP helps to instill the importance of good nutrition early in the life cycle. Families with young children are the target audience. Last year, 66 percent of the children in EFNEP families were under 8 years of age; 48 percent of these were under 5. Current data indicate that 10 percent of the EFNEP participants are pregnant with their first child.

Multiagency Cooperation

EFNEP informs participants of available community resources that can assist with nutrition and related concerns. The USDA's Food and Nutrition Service (FNS) provides assistance through the Food Stamp Program; Women, Infants, and Children Program; and Child Nutrition Program. EFNEP provides referrals to such programs and teaches participants how to manage their food dollars, purchase and prepare nutritious meals, and understand the importance of nutrition in prenatal and infant care.

Last year, EFNEP families used FNS programs to the following extent: 66 percent were food stamp recipients, 44 percent participated in the Women, Infants, and Children Program, and 79 percent of the participants' children were enrolled in a Child Nutrition Program. Continued cooperation with FNS and other local agencies improves assistance to the hard-to-reach and increases the cost-effectiveness of program delivery.

Food Recall Scores

The difference EFNEP makes in behavior is measured by a 24-hour food recall taken on adults when they enter the program and again when they complete their participation. It has been observed that adult participants usually feed their children a more nutritious diet than they consume themselves. The food recall scores show that significant, measurable, and documented changes take place in participants' diets, especially in the milk, meat, and fruits and vegetables food groups.

Long-term and spinoff benefits also occur. The following examples typify those found in all States and territories:

- 4,200 Michigan families improved their diets after being taught the "Eating Right Is Basic" curriculum. Among this group, 86 families and 20 paraprofessional staff members are off public assistance at a savings of \$20,000 per month; children from 32 families were returned from foster care at a savings of \$50,000 per year; 107 participants received training for employment; and 50 homemakers completed high school.
- Arkansas reports that 556 youth produced and preserved food with an estimated \$77,848 gain in family finances, and 2,173 4-H EFNEP youth adopted improved diet and health habits.

-
- Seven thousand EFNEP youth in Massachusetts ate more nutrient-dense snacks, exercised more, and ate fewer high-sugar, high-salt foods.
 - Among 15,682 EFNEP youth in New York State, an average of 84 percent know the relationship between food and health; can identify food sources for selected nutrients; tasted new foods; and reported eating fruits and vegetables for snacks/meals.

Extension Service Innovations

The Extension Service (ES) initiated efforts in seven States to test educational methods and the cost-effectiveness of teaching the nutrition curriculum through preformed groups. Results of these projects will be used to introduce cost-effective programming to States.

Through cooperation from the private sector (Kraft, Inc), six States received grants to develop new program concepts and audiovisuals. The systematic testing of new concepts, along with reviewing and assessing the program, ensure greater cost-effectiveness.



The United States has the most abundant, safe, wholesome, nutritious, and low-cost food supply in the world. Results of recent research, technology, and education provide opportunities to continue to improve food quality, safety, and processing and preservation techniques from farm to consumer.

Detection and Control of Microbial and Chemical Contaminants

Recent incidents of microbial foodborne outbreaks and contamination of food by pesticides have sensitized the public to the importance of detection and control of microorganisms and chemicals in foods. Consumers are interested in fresh or minimally processed foods and also in prepared, gourmet-style foods. It is a challenge to the food industry to present these foods safely and attractively to the consumer through the food distribution systems using controlled atmosphere and/or refrigeration.

Research on microbial control to extend the shelf-life of foods has focused on combinations of techniques, each of which will not control microbial growth by itself but when combined will present a barrier to microbial growth (hurdle technology). To help utilize these techniques, the Agricultural Research Service (ARS) developed "user-friendly" software for rapid estimation of the effects and interactions of selected food formulation and storage factors on the growth of *Listeria monocytogenes* and *Salmonella*.

Detailed specific research is continuing to extend these programs to other organisms. Researchers have demonstrated, for instance, that the efficacy of nitrite against

* Material for this section was prepared by Jane Robens (coordinator), Agricultural Research Center, USDA; Beth Branthaver and George W. Meyerholz, Extension Service, USDA; Susan Cuppett, Glen Froning, and Randy Wehling, University of Nebraska, Lincoln; and Daryl Lund, Rutgers University.

Clostridium botulinum in meat products is severely hampered by the inclusion of blood fractions. In addition, ARS demonstrated that irradiation of *Salmonella*-contaminated meat before cooking greatly enhances the destruction of bacteria with heat. Reduction in analysis time for detecting microbial contamination of foods is essential, given the rapid food delivery system used to maintain product quality. For instance, current detection of foodborne viruses relies on slow and expensive tissue culture methods. Researchers at Rutgers University and other laboratories are investigating promising molecular biology techniques that have the potential to achieve more rapid and sensitive detection of pathogens.

Altering Food Composition for Health Purposes

During the last two decades, the American consumer has been educated about the health benefits of foods that are low in cholesterol and saturated fat. One promising technology that will reduce the level of cholesterol and saturated fat in foods is supercritical fluid extraction. This process uses a gas, generally carbon dioxide, under conditions of elevated temperature and high pressure to extract cholesterol and triglycerides from foods.

- In dried egg yolk, supercritical carbon dioxide will remove up to 65 percent of the cholesterol and 35 percent of the fat. As increased amounts of cholesterol and triglycerides are removed from the dried egg yolks using carefully controlled temperatures and pressure, improvement in functionality (emulsifying efficiency in sponge cakes and mayonnaise) occurs due to a concentration of protein and phospholipids.
- Supercritical carbon dioxide also has been used to fractionate butterfat, and the process can select for specific molecular weight triglycerides. The result is a "butter" that is less saturated and more spreadable at refrigerated temperatures.
- By evaluating additions of unsaturated fats to animal feed, researchers hope to alter pork fat levels of polyunsaturated fatty acids and reduce the percentage of saturated fatty acids, enabling meat producers to meet the recommendations of major health agencies, including the USDA.
- The Harlan E. Moore Heart Research Foundation, the University of Illinois, USDA's Office of International Cooperation and Development and Agricultural Stabilization and Conservation Service, and the National Academy of Sciences collaborated on a research project with Hungary to produce pork that is low in fat with balanced fatty acids, using full-fat soybeans and sunflower seeds in rations for finishing swine. This effort can aid the U.S. pork and soybean industries.

Promoting Food Safety

The Cooperative Extension System (CES) targets food safety education to different clientele groups including producers, processors, commercial and institutional food handlers, and consumers. The principles taught and methods used are based upon the

identified needs of the target audience. Although programs vary from State to State, the overall goals are to teach people how to properly produce, process, and handle food to minimize any health risks associated with its consumption and to increase the level of understanding about food safety regulation and how risks are assessed.

In cooperation with land-grant universities, USDA agencies, and the Food and Drug Administration, CES developed programs on safe food production. The Food Animal Residue Avoidance Program promotes proper and safe animal drug and pesticide use. Integrated Pest Management, Pesticide Applicator Training, and Pesticide Impact Assessment programs have helped to reduce both the use of pesticides and improper application. Overall, residue violation rates in animals have decreased by 81 percent since 1978, and extension's education programs assisted with this reduction. More than 30 State Cooperative Extension Services are cooperating with government and industry organizations to develop voluntary quality assurance programs to reduce residues.

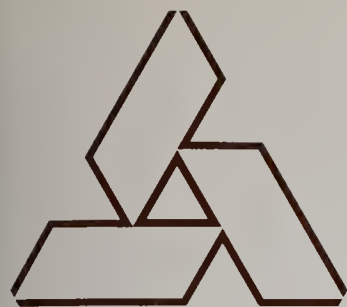
Additional education efforts are being conducted to decrease microbiologic contamination during production, processing, and preparation that can result in foodborne diseases. In addition, the CES has traditionally been a source of reliable food safety information for consumers. Data collected over the last several years indicate that Extension answers about 3 million telephone inquiries, reaches 45 to 50 million people through the media, and involves 10 million households in a variety of Extension programs annually.

HIGHLANDS COUNTY OFFICE OF
ECONOMIC DEVELOPMENT

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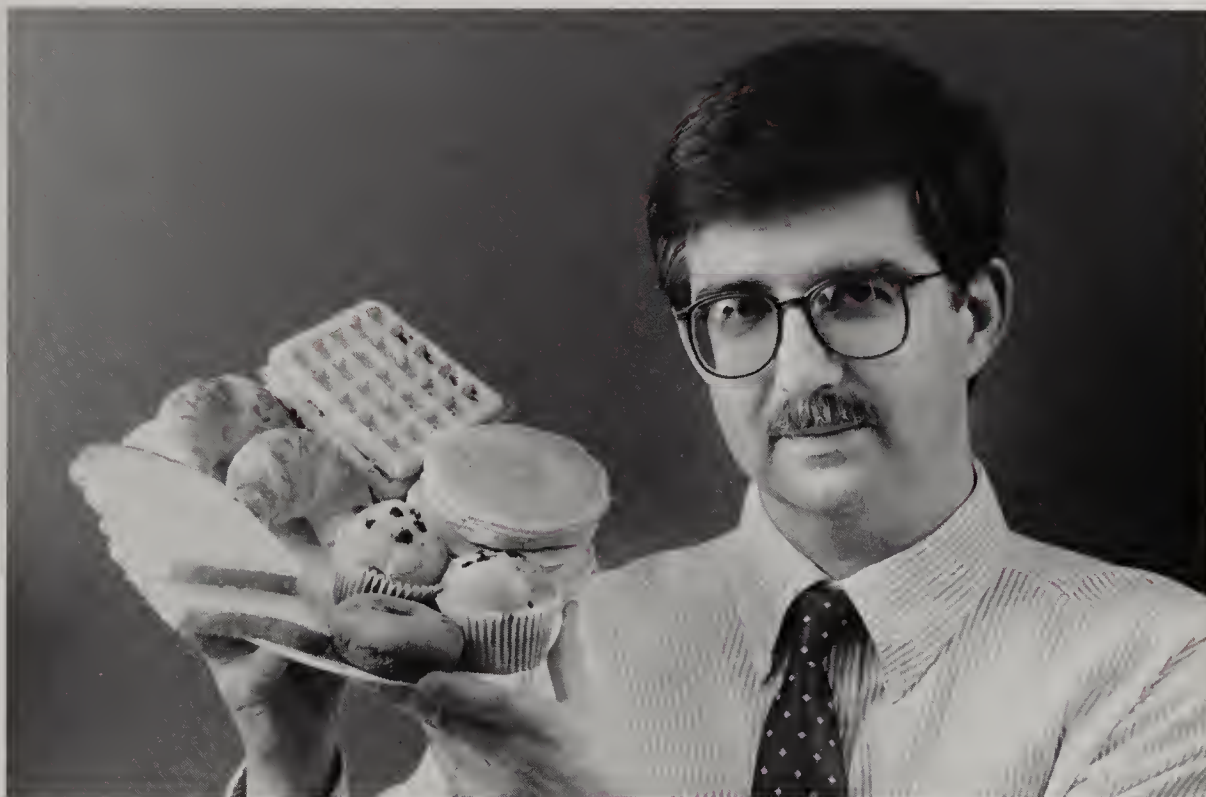
COINS
COLD SILVER





VI. Accomplishments – Rural America

Rural Economic Development*



USDA's authorizing legislation gives the Department the lead Federal responsibility for coordinating rural development programs. The Cooperative Extension System enhances rural economic development by assisting in increasing jobs, improving incomes, and strengthening community facilities and services. Extension programs focus on: small business management, community economic analysis, industrial development, community decisionmaking, retention and expansion of existing businesses, plant shutdown and worker displacement assistance, and entrepreneurship. Research programs provide innovative technologies that can be the basis for new and expanded agribusinesses in rural areas.

Revitalizing Rural America

- New York's Small Business Energy Efficiency Program (SBEEP) provided 7,780 free energy surveys and several conservation seminars to small businesses, nonprofit organizations, farms, and agribusinesses in the State. A savings of \$8.2 million would result if all the conservation recommendations were implemented. The organizations implementing the conservation measures receive a 65-percent return on investment the first year.
- Iowa's "Visions for the 90's" program helped communities in northeast Iowa understand and manage change. Through a series of forums, leaders focused on changing economic and social realities, setting priorities, and identifying strategies and actions for addressing problems. As a result of this program, Alamakee and Howard

* Material for this section was provided by Beth Walter Honadle (coordinator) and W. Robert Lovan, Extension Service, USDA; and Kenneth Stone, Iowa State University.

Counties formed countywide economic development organizations; Grundy and Fayette Counties are forming economic development organizations; Howard and Butler Counties conducted countywide economic development workshops to develop plans of work for their economic development organizations; and five counties are cooperating to market tourism.

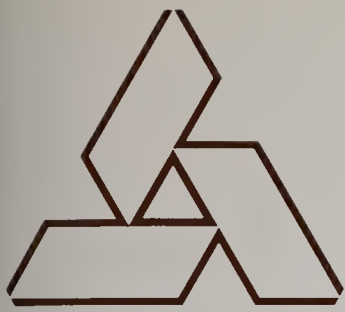
- The Rural Information Center (RIC), a joint program of the Extension Service and the National Agricultural Library (NAL), established partnerships with State extension specialists and State librarians for the purposes of: (1) monitoring the types of assistance requested so that extension can identify emerging rural issues and (2) providing faster accessibility to research articles, case studies, and other information from State and local library sources rather than NAL. Extension specialists from 49 States and Guam and 22 State librarians participate in these networks, which also promote improved coordination of programs at the State and local levels.
- RIC also sponsored two graduate interns and cosponsored a conference on information and rural economic development with the Center for Rural Librarianship, Clarion University of Pennsylvania.
- Idaho Cooperative Extension Service cosponsored a workshop, "Adapting in Idaho Agriculture," with the State department of economic development, a chamber of commerce, North Idaho College, and a number of other entities. More than 170 people attended the workshop, which focused on alternative methods of using a part-time business to generate more income on small farms. The sessions covered ideas of what to do to earn extra money, how to do it, and potential resources available.
- Rural development policy options and priorities were the topics of a series of four workshops held across the country. The 700 participants represented education, infrastructure, health interests, and local government officials who had not previously interacted.
- Extension was involved in a project with the National Rural Electric Cooperative Association (NRECA) and a private consulting firm to help rural electric cooperatives develop business incubators. The team conducted an analysis of the business incubator concept for an electric cooperative in southwestern Louisiana. Extension's role was to assess entrepreneurship potential, management and business services, and marketing issues. The team also provided startup assistance and help in determining appropriate roles and relationships for potential partners in a business incubator in North Dakota.
- The Farming Alternatives Project developed at Cornell University assists farm families to evaluate and develop new farm-based enterprises and marketing strategies. Rather than focusing on specific commodities, the project emphasizes the business planning, marketing, and management issues involved in developing any new or nontraditional farm-based enterprise.
- Cooperative Extension at Purdue University received support to establish a Rural Technology Center in cooperation with the School of Technology. This effort is expected to provide alternative solutions to industry groups and product opportunities for Indiana companies.

Cooperative Research and Development Agreements

The successful transfer of technologies from Federal research laboratories to the private sector can increase the number of small businesses, reduce unemployment, and, in general, enhance the economic viability of rural areas. The Agricultural Research Service (ARS) has more than 45 agreements with small rural businesses to commercialize new products and/or processes that were developed by Federal scientists.

- An Illinois company produced more than 300,000 filters that use "super slurper" (a water scavenging product made from cornstarch) to remove moisture from gasoline and diesel fuel. The company employs 100 people, a 400-percent increase since 1983.
- An Idaho firm manufactured a line of products based on "super slurper," including medical cold packs and bulk absorbents for agricultural uses. This case study documents the creation of 50 new jobs in a mining town where unemployment is high.
- A small company in Oregon produced and sold 150,000 traps for capturing and destroying Japanese beetles. The traps operate by attracting the beetles with small amounts of pheromone, a sex attractant.
- An Illinois firm currently produces a no-calorie extender made from corn cobs. ARS scientists developed the product, which is used as a dietary fiber ingredient for food products.
- ARS scientists were instrumental in assisting local farmers and Three Rivers Produce, a vegetable packing and marketing operation, to decide which alternative/high value crops are most growable and marketable in Southeastern Oklahoma. The harvest of alternative crops has grown from 88,000 pounds in 1985 to more than 2 million pounds, providing extra income for 22 farmers and jobs for local workers in the packing plant.





VII. Accomplishments – Youth, Families, and Communities

Family Community Leadership*



Forty-six States and Guam are actively involved in successful Family Community Leadership (FCL) programs, and the four remaining States plus the District of Columbia, Puerto Rico, and Micronesia are planning FCL programs.

Strong leadership is vital to the well-being of families and communities. This is particularly true when rapid social and technological changes continue to put new pressure on people and institutions.

What Is Family Community Leadership?

Family Community Leadership is an adult education program that is primarily—but not exclusively—for women. Its purpose is to help people develop skills and confidence needed for leadership positions and to help them understand public policy issues related to families and communities. Nationally, FCL is sponsored by the National Extension Homemakers Council and the USDA Extension Service. In States, FCL is sponsored jointly by the State Cooperative Extension Services and State Extension Homemakers Councils. Initial funding in 1981 from the W.K. Kellogg Foundation assisted six States to test and develop the concept; since 1986, it has rapidly expanded to all the States.

FCL goals:

- Educational improvement—To broaden participants' understanding of complex public issues and methods useful in their resolution.

* Material for this section was prepared by Jeanne M. Priester (coordinator), Extension Service, USDA; and Lois R. Bassett and James C. Barron, consultants for W.K. Kellogg Foundation.

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- Increased participation in public affairs—To increase the effective participation of family members in resolving important public issues affecting the quality of family life.
 - Organizational development—To strengthen and further develop educational support systems for public affairs leaders and groups.

How Does FCL Work?

Leadership and public policy decisionmaking skills are taught to participants in groups who in turn teach other groups of citizens in their respective communities. A 30-hour curriculum, combined with practice, experience, and additional learning over time, prepares people to be FCL trainers. A commitment of time—about 1 to 2 days per month for a year—is made by trainers to train others at State and local levels.

The workshops concentrate on developing leadership skills for unraveling community problems, working within groups, managing volunteer programs, identifying and analyzing issues, analyzing and forming public policy, and teaching others. Trainers learn how to get groups to work together to resolve conflicts and negotiate compromise.

Does FCL Make a Difference?

Many people have benefited from increased knowledge and skills, and they are putting them into practice to address community issues.

- In Briscoe County, Texas, a small rural community, the local FCL team conducted a citizens' forum featuring political candidates and providing educational information. Voters indicated they were better informed and prepared to vote as a result of the forum.
- In Preston County, West Virginia, FCL trainers organized a high school voter registration program. Twenty-two women were trained and deputized. As a result, 355 of the 395 18-year-olds were registered, and 300 voted in the next election.
- Missouri expanded their FCL program to include economically disadvantaged youth in an 18-hour leadership development and community awareness workshop. The youth indicated they had learned leadership skills that can be shared with others. However, the information on understanding themselves received the highest rating.
- In Montgomery County, Kentucky, FCL held an open seminar on solid waste disposal to provide non-biased information on a controversial issue. They contacted influential leaders, built and displayed a booth at the fair, helped a group member get appointed to the planning board, and assisted in a house-to-house petition. As a result, the community is looking seriously at a county-wide zoning plan.

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- Raw sewage and chemical waste dumped on farmland motivated a Wilton, Maine, FCL volunteer to organize the community to enact laws to ensure cleanup and prevent future dumping.
 - In California, one FCL trainer is director of support services for the State National Guard. She and her FCL team conducted a team building workshop for Guard members who are organizing support groups in their areas. Participants were from diverse occupations throughout the State.
 - In Ohio, 160 teenagers attended three Teen Leadership Colleges sponsored by the Greene County Sheriff's Youth Activity Fund in conjunction with the FCL program. Leadership skills such as communication and feedback, goal setting, developing support systems, and dealing with change were taught by integrating them into topics on teen suicide and teen pregnancy.

Thousands of other examples can be found of individuals and FCL teams conducting educational programs, organizing groups, and mobilizing community resources to solve local problems. Many FCL volunteers have been elected to public office or appointed to official positions. The effects are widespread and range from individual families to statewide issues.

The final beneficiaries of FCL training are the people in hundreds of communities who enjoy better schools, libraries, community facilities and services, and a wide range of other public policies that reflect citizen and community interest.

Family Resource Management*



American families in unprecedented numbers are feeling the impact of eroding purchasing power and changing employment opportunities. When the economic well-being of families suffers, so does the health of the Nation. Fortunately, regardless of their incomes, families equipped with the skills to maximize financial resources are more likely to experience marital satisfaction, employment productivity, family stability, and a better quality of life. Providing families with these financial management skills is one of the challenges of the Cooperative Extension System.

The Response

Through audience-targeted Extension education, thousands of low- and middle-income families (more than 400,000 in 14 States reporting impacts in 1989) gained the knowledge and analytical skills essential to managing money and making wise consumer decisions. Direct educational contacts were accomplished via computer analyses, learn-at-home courses, work-site workshops, money management classes, one-on-one counseling, and resource management newsletters.

Extension reached many more families indirectly with money management education by training volunteer budget counselors and youth leaders. The 12 States

* Material for this section was prepared by Jane Schuchardt (coordinator), Extension Service, USDA, and Jeanne Hogarth, Cornell University Cooperative Extension Service.

reporting impacts in 1989 trained 6,104 volunteers. Extension also trained other multipliers from social service agencies, industry, and professional and educational organizations to work effectively with client families and youth on money management skill-building.

Results

As a result of educational intervention by Extension, on average:

- eight out of ten families set up a budget to monitor spending;
- two out of three began saving money regularly; and
- one out of four was able to significantly reduce consumer debt.

Families improved communications about money use, gained a better sense of control over their money, and became aware of attitudes about money being passed on to their children. They also identified and developed plans for reaching financial goals, such as retirement security.

Anecdotal comments further illustrate impact. "I can see the light at the end of the tunnel and realize there is hope," said a limited-income participant in New Hampshire. "We have a budget and savings account for the first time in our lives," said another participant in Iowa. Recounting a success story involving a young couple near bankruptcy in Kentucky, an Extension employee wrote, "It will take a while, but they are working to get things paid off, changing their lifestyle to reach needs before wants, and not living in a constant crisis."

Programs That Work

- New York: Efforts in retirement planning education reached 3,200 persons through workshops and 40,500 more through newsletter series. One county's evaluation of 237 program participants showed 85 percent were stimulated to make financial plans for retirement. Extension educators cooperated with employers, local governments, chambers of commerce, senior citizens' councils, and personnel associations. A popular learning tool was the computer program "Ready, Set, Retire," designed to help pre-retirees plan savings needed to maintain a satisfying level of living in retirement.
- Wisconsin: The educational program "Consumer Fraud and Deception: How To Protect Yourself" reached 12,000 families in 30 counties. In a sample of 580 families who participated in the program, 83 percent reported greater confidence in avoiding unfair sales practices. Ninety percent said they now knew where to report fraud and deception, and 77 percent said they were more likely to make a complaint.
- Florida: Eleven out of 67 counties in Florida trained volunteer budget counselors. In one county, 15 volunteers, trained by Extension, reached 58 families with severe money problems. Aside from individual credit counseling, participants

attended a 7-week basic money skills seminar, received a monthly credit newsletter, and completed a learn-by-mail series. The 34 families who provided evaluation data said they were able to cut the number of creditors about 20 percent. Nearly two-thirds of these families began contributing regularly to a savings account.

Consequences of Non-response

Financial difficulties are a leading cause of divorce and can be linked to substance abuse, suicide, and child and spouse abuse. Clearly, empowering families with financial management and consumer decisionmaking skills will not solve all ills. But the Cooperative Extension System, via its nationwide network and family-centered, research-based educational approach, can fill an educational niche otherwise only available to those who can afford fee-based financial services.

Health Status of Rural Elderly*



Over 30 percent of adults 65 years and older in this country live in areas that can be defined as rural. Many of this group have made important contributions to the agricultural economy. Despite this history and the recent heightened attention to America's elderly, the particular needs of older rural adults have been overlooked.

Low incomes, increasing frailty, and geographic isolation, coupled with poor service delivery, continue to affect the quality of life of a significant number of older rural Americans. Nevertheless, there continues to be a common misperception that older adults in rural areas generally experience a healthier, happier way of life and at less cost than their urban counterparts.

Partnerships in Research

Agricultural experiment station research is focusing on the health needs of older rural adults in an effort to assure that the needs of this population are met. University of North Carolina researchers, with assistance from service deliverers, local policymakers, and extension, are studying a representative group of older adults over time. Major objectives are to determine what changes occur in the lives of older rural adults, how they meet their final health challenges, and how their needs translate into policies and services.

The research, begun 13 years ago on 418 persons 65 years or older, is currently in its third wave of data collection. Initially funded in 1976 entirely through the

* Material for this section was provided by Vira R. Kivett (coordinator) and Jacqueline H. Voss, University of North Carolina-Greensboro.

North Carolina Agricultural Research Service, the latter two phases of the research (1986 and 1989) have been supported in part by the American Association of Retired Persons' Andrus Foundation.

Illness and Displacement

The results of the research show the tenacity of the older rural population, yet point out the difficulty that many older persons have in remaining in the communities when critical health needs occur. Among the 52 percent of adults not surviving the initial 10-year period, only one in four died at home or in the home of a relative; two-thirds died in hospitals or other facilities out of the home county or in an adjoining State.

Adversity in Survivorship

The rural dilemma also has implications for many survivors, of whom one in three seldom went out or were confined to the home in some way; three in four had one or more health problems; one in four was dependent upon someone for daily assistance (usually a family member); three in four were on prescribed medicines.

Limited Rural Resources

Data from this research, as well as that of other researchers, show the difficulty that many older rural adults face in meeting their medical-related needs. The lack of local pharmacies, hospitals, clinics, medical personnel and facilities, and local services places untold burdens on family members and displaces older adults from family and community during health crises. These problems have an impact on others already being experienced by many rural families coping with the faltering economy.

Outcomes and Accomplishments

The university research is contributing to policy development and to improved human services. Findings and recommendations from this research were presented to local rural service providers, county commissioners, legislative delegates, and representatives of the regional Area Agency on Aging. As a result, a number of initiatives were taken:

- The procurement of an Elderly Coordinator to coordinate existing programs and develop needed services.
- The designation of a senior center as a top legislative priority.
- The development of a mobile meals program for the homebound elderly.

State and National Outreach

Research sponsored through the State agricultural experiment station system, although frequently region-specific, is contributing to important State and national policies for the elderly. In the longitudinal effort described here, phase one data served as background material for the 1981 White House Conference on Aging. Data were also presented as supportive material before the U.S. Senate Special Committee on Aging (Older Rural Americans). Phase two data were used as resource materials for the 1988 Governor's Conference in North Carolina as well as presented before the Committee for Gerontological Research of the North Carolina Legislature.

Future Challenges

Research-advocacy roles are increasingly important among social science researchers in land-grant institutions. This research approach greatly enhances cooperative connections among policymakers, researchers, and program administrators. As a result, the research data, while making a substantive contribution to the empirical literature, also serve to improve the condition of various populations.

Research agendas continue to grow with the increasing migration of older citizens to small towns and rural areas. Information on this important group, along with needed data on the many subgroups of rural elderly, pose additional research challenges to land-grant universities.

Volunteer Staff Development*



Volunteers are an integral and essential part of the Cooperative Extension System (CES). This educational outreach program of USDA and the land-grant universities would be severely limited without the existing partnership between salaried and volunteer staff. While national surveys indicate a trend in decreasing numbers of volunteers, CES has experienced an increase in both volunteer numbers and involvement. Volunteers working with the 4-H Youth program, for example, increased by almost 18,000 over last year. Extension Homemakers spent 770,265 hours and reached 5,758,794 people.

4-H Volunteers

With assistance from the National 4-H Council, CES has benefited from numerous grants and corporate contributions in support of volunteer development. A key result of a 3-year grant from the W. K. Kellogg Foundation was increased emphasis on youth involvement in volunteer leadership roles. During the "Volunteers for the Future" project, it is estimated that more than 30,000 volunteers received training in 42 States. Training focused primarily on three areas of volunteer involvement: volunteers serving in middle management capacities; strengthening boards, councils, and committees; and youth serving as volunteers. Leader

* Material for this section was prepared by Stephen Mullen (coordinator), Extension Service, USDA; and Dorothy Wilson, Langston University.

training material for volunteers working with culturally diverse youth was developed in cooperation with Youth for Understanding.

Agriculture and Community Development Volunteers

Volunteers are assuming increased roles of public policy education on commodity-related issues and on issues faced by rural communities. Greater emphasis is now placed on providing volunteers with leadership skills to contribute substantially to rural revitalization.

Home Economics

The National Extension Homemakers Council and its member councils in 44 States, the Virgin Islands, and Puerto Rico provide many of the volunteers for coordinators, middle management, and community level volunteer roles. An educational project on seat belt usage, alcohol impairment, and traffic safety was funded by the Department of Transportation. Leadership for the program was provided by 400 volunteer project directors and associates and extension faculty. The program reached 7 million adults and youth directly and another 16 million through mass media.

Building Human Capital

While all national CES initiatives rely to some degree on volunteer input and involvement, the "Building Human Capital" initiative specifically focuses on expanding volunteer capability and capacities. For example, four youth volunteer involvement models were selected to promote youth serving as advocates for their peers in their communities. State teams of adults and youth received training in one of three youth involvement models including: DARE To Be You (Colorado), Project LEAD (Quest International & Association of Junior Leagues, Inc.), and Is Anyone Listening? (Wyoming). In addition, all teams received a day of training in citizen advocacy and organizing local support.

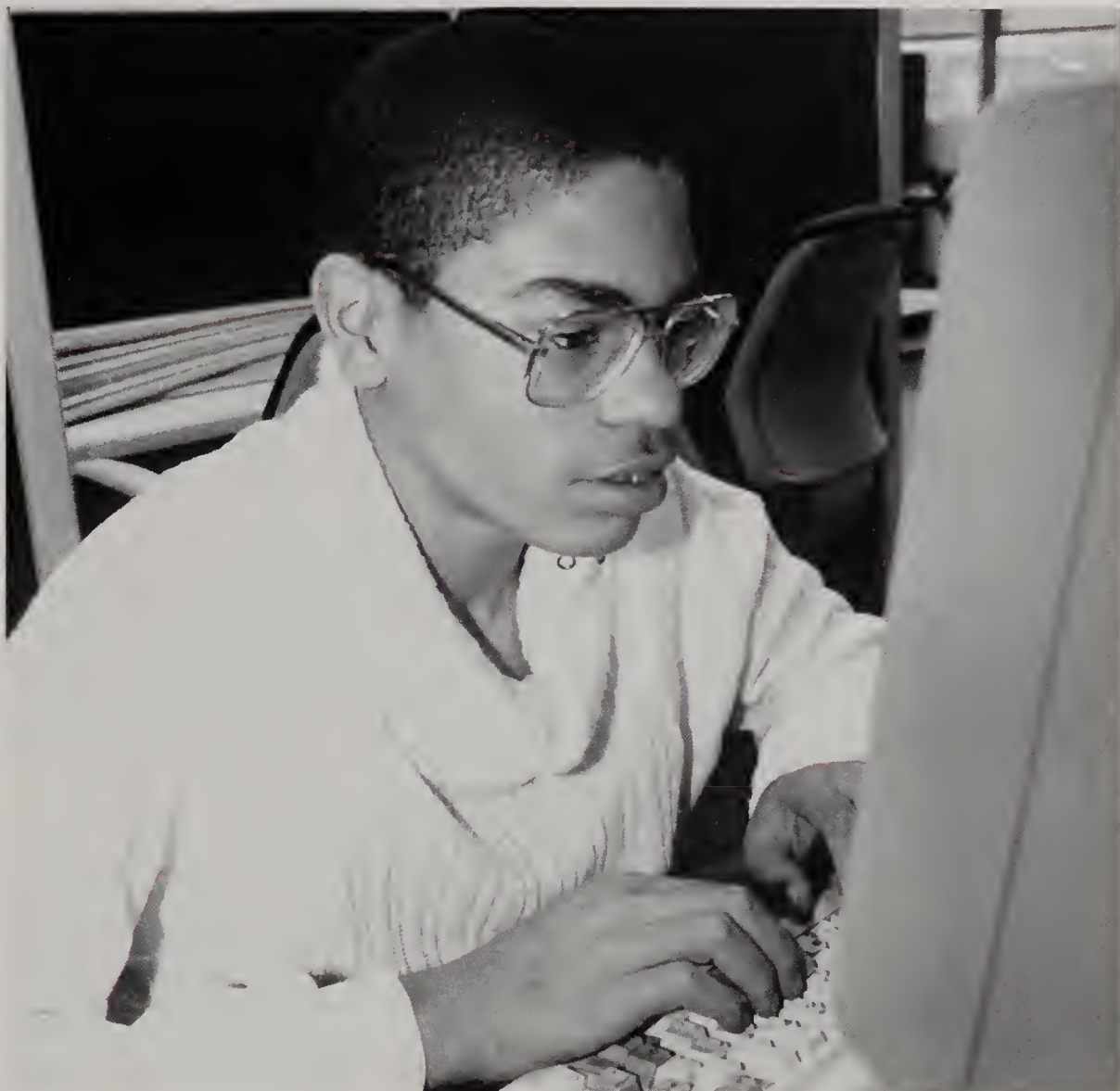
Another focus of the "Building Human Capital" initiative is on Master Volunteers. To become "Masters," volunteers are required to complete intensive subject-matter training. In return, volunteers agree to assist in teaching others, respond to questions from the general public, and share what they learn with other clientele. In agriculture, Master Gardeners and Master Pesticide Applicators play significant roles. Home Economics Master Volunteer programs are active in more than 30 States in areas such as food preservation and nutrition, health management, and parenting and family life skills. The 4-H Program focuses on management, training, and supervisory capacities with other volunteers. Last year, more than 2,000 volunteers were involved in a comprehensive pilot program intended to improve teaching skills. The program, "T3 - Training Trainers to Teach," is a 30-hour program to prepare trainers as more effective teachers of other volunteers and youth. It is estimated that 20,000 volunteers will receive training in the T3 curriculum beginning in October 1989.

The diversity of volunteer involvement is striking:

- Kentucky Extension Homemakers made anatomically correct dolls for use by the Kentucky Council on Child Abuse in counseling parents and children. In all, members contributed 196,333 hours sharing extension information with 412,906 recipients. Each member reached an average of 11.9 persons. More than 54,000 hours were expended with youth groups and more than 60,000 with other agencies and organizations.
- In Oklahoma, statewide satellite communications reached and trained volunteers with programs in natural resources, animal science, volunteer recruitment, photography, and youth development. Volunteers who were unable to view the programs live checked out videotapes from their county extension offices.
- In Minnesota, Master Gardeners saw their teaching emphasis shift sharply as the drought put new strains on lawn and garden care. To date, more than 900 Master Gardeners received at least 50 hours of training. Some now have 10 or more years of experience.
- In Texas, nearly 50,000 community leaders served on county program executive councils and subject-matter area committees.
- A CES 4-H middle-management recruitment model, used in Seattle, Washington, increased the number of low-income volunteers from 380 to 526.
- Missouri's master and junior volunteers expanded the outreach on energy programs. Each volunteer reached an average of 159 people.

The CES has an outstanding record of volunteer involvement. This partnership between salaried and volunteer staff has proven essential in identifying needs and developing educational programs in response. The dynamic relationship of salaried staff, clientele, and volunteers has enabled the CES to respond to the needs and challenges of local communities.

Youth Development Education*



Current statistics and trends paint a grim picture of a Nation that is poorly preparing its young to cope with present realities—let alone future problems. Youth at risk is no longer a topic for just social workers, educators, and the media. The Cooperative Extension System (CES) and the National Agricultural Library (NAL) added youth at risk and youth development to their 1989 agendas.

Youth at Risk

The USDA Extension Service (ES) and the Cooperative Extension System established a national task force on a new initiative: Youth At Risk. This initiative focuses on the problems facing youth today, including drugs, school dropouts, teen pregnancy, illiteracy, child abuse, and neglect. The Youth At Risk Task Force

* Material for this section was provided by Jon E. Irby (coordinator) and Joel Soobitsky, Extension Service, USDA; Leah B. Hoopfer, Michigan State University; and Sandra Facinoli, National Agricultural Library, USDA.

studied these symptoms carefully and identified their primary causes as lack of parenting, poverty, and negative peer pressure. This national neglect of children and families has led to costly programs for addiction, welfare, and incarceration. Educational programs that focus on the positive development of youth plus the development of skills for parents and community leaders offer youth the opportunity to reach productive adulthood. These programs are less expensive than treatment programs and are within the range of expertise for the Extension System to lead. Last year, 260 staff were mobilized to implement programs to reach the Youth At Risk audience.

The CES Task Force identified collaboration, cooperation, and community capacity-building as three major strategies to employ in prevention and intervention programming. Some examples of model programs that are already underway to support the Youth At Risk initiative are:

- **SPACES:** Preparing youth for a high-tech, global future. A Michigan program, developed with funding from the W.K. Kellogg Foundation, is designed to help adolescents (9 to 15) enter the world of the future with the confidence and skills they need to succeed. This program provides experiences in three critical areas: science and technology, personal coping skills, and global issues. The program reached 7,500 Michigan youth and 750 volunteers in 1989. A curriculum package titled "Help Me — I'm Growing Up! Understanding Early Adolescents" includes videotape, guides, and workbook.

- **PACT (Parents and Adolescents Can Talk):** Through the PACT program, young people build positive self-concepts and improve their interpersonal communication and decisionmaking skills. These skills enable them to exercise greater responsibility over their sexual behavior and to resist media and peer pressure to become sexually active. The major thrust of PACT is open communication between parents and youth. Developed at Montana State University and funded in part by the U. S. Department of Health and Human Services, PACT can be delivered in both community and school situations.

Evaluations from 500 Montana PACT participants reveal significant increases in parent-youth communication, increased knowledge of physiology and reproductive health, and a positive overall response to the program. Results show a positive correlation between high self-esteem, a lower incidence of sexual activity among youth, and no significant increase in sexual behaviors. Youth respondents report increased self-esteem, and 89 percent of parents queried report increased self-confidence in their parenting role. The PACT program leaves a cadre of adults within a community to provide ongoing leadership for implementing a local program.

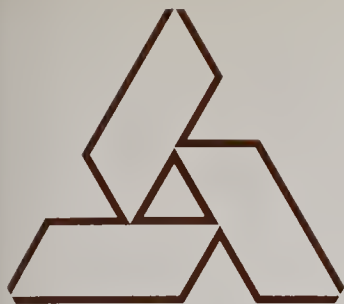
- **Tackling Tough Stuff:** This is a curriculum of activities and experiences developed by the University of Minnesota to teach young people to recognize stress and depression and to take positive steps for self-protection for themselves and their friends. The experiential curriculum is designed for use with young people 12 to 17 years old. Leader guides and a video accompany the seven lessons. 4-H

or other youth group leaders can select lessons or individual exercises to use at club meetings, retreats, family programs, or other 4-H events. Last year, 6,500 adults received training on the Tackling Tough Stuff curriculum. It is estimated that those individuals worked with more than 300,000 youth.

Information Center for Youth Development Professionals

The Youth Development Information Center is a joint project of the Extension Service and the National Agricultural Library. An outgrowth of USDA-funded research at Mississippi and Ohio State Universities, the Center manages the newly created youth development database, 4hprk (4-H professional research and knowledge), which is part of NAL's bibliographic database, AGRICOLA. Composed of resource materials supporting the youth professional's work with youth-at-risk and extension's other national initiatives, the database includes more than 1,000 abstracted citations to materials that have been reviewed, selected, and abstracted by youth professionals throughout the country. The Center published a set of corresponding bibliographies representing the five categories in the youth development collection: communication, educational design, youth development, youth program management, and volunteerism. The Center's resources are tapped nationwide by youth development professionals.





VIII. Accomplishments – Joint Council, National Committees, and Regional Councils

Throughout the year, the Joint Council, the National Committees, and the Regional Councils met to develop and review priorities and accomplishments for the Joint Council reports.

The following is a summary of the major accomplishments and activities of the Joint Council and the Northeast and Western Regional Councils. In addition to identifying their accomplishments, the National Agricultural Research Committee, National Extension Committee, and National Higher Education Committee summaries provide: a historical overview, a description of their relationship to the functional area, and how they provide input to the Joint Council.

Joint Council on Food and Agricultural Sciences

Fiscal Year 1991 Priorities

The Joint Council received priority recommendations from the National Committees on Agricultural Research, Extension, and Higher Education and from the Northeast and Western Regional Councils. Utilizing this information, the Joint Council selected 12 priorities for Fiscal Year 1991. They are listed in rank order:

1. Improve Water Quality and Quantity
2. Expand Biotechnology and Its Applications
3. Develop Agricultural Production Systems Compatible With the Environment
4. Nurture the Nation's Talent Base in the Food and Agricultural Sciences
5. Improve Understanding of Diet, Human Nutrition, and Health Relationships
6. Enhance Competitiveness of U.S. Agriculture
7. Genetically Improve Economically Important Plants
8. Improve Safety and Quality of Food Products
9. Investigate Potential Effects of Global Climate Changes on Agricultural and Forest Productivity
10. Enhance Control of Agricultural and Forest Pests and Diseases
11. Develop New and Expanded Uses for Agricultural and Forest Products
12. Enhance Rural Economic Development

Major Activities

Major issues examined during 1989 include:

- Biological control of insects, including regulatory guidelines.
- Predicting global climate change and potential impacts upon agricultural production and its location.
- Preparation of a special report summarizing the history and future directions of planning within the food and agricultural science and education system.
- Evaluating Joint Council activities and congressional mandate.
- The USDA Water Quality Initiative.
- Future challenges facing the food and agricultural science and education system (Guest speaker: Secretary Clayton Yeutter).
- Improving Joint Council activities (Guest speaker: Congressman George Brown).
- Social sciences agricultural agenda project.
- The National Agricultural Research Initiative.
- Information management: supporting agricultural research, extension, and higher education.
- Agricultural engineering assessments and implications.
- Improving food safety and quality: applying irradiation technology.
- The 1890 historically black institutions centennial celebration.
- International research and education programs.

Joint Council Evaluation Project

The Joint Council underwent an examination of past and current activities relative to the congressional mandate by which the Council operates. The evaluation also included a discussion of future activities that the Council should strengthen, namely interactions with the Office of the Secretary and with the Congress. Many sound recommendations were proffered and the Council is establishing priorities for implementing many of them.

The Five-Year Plan

The Joint Council is in the process of revising the Five-Year Plan into a strategic plan for the food and agricultural science and education system. The new plan should be available for distribution in late 1990.

National Agricultural Research Committee

The National Agricultural Research Committee (NARC) is one of three functional committees established by the Joint Council. Its purpose is to foster planning and coordination among the State Agricultural Experiment Stations, research agencies of the USDA, 1890 Colleges and Tuskegee Institute, and other institutions, organizations, and firms that conduct research in food, agriculture, and forestry. NARC reports annually to the Joint Council.

NARC provides a liaison member to the National Extension Committee and the National Higher Education Committee, and each of those committees provides a liaison member to NARC. The purpose is to interact directly on issues of mutual concern and interest.

How the NARC Determines Priorities and Accomplishments To Be Submitted

The Joint Council guidance is provided to the member organizations through their respective organizational representatives. Member input is sought on specific items; e.g. priorities and accomplishments as requested by the Joint Council. Members submit suggestions, and consensus is developed on the areas to be solicited for individual submissions and the number of submissions to be accepted from each organization.

The representatives obtain suggestions from their organizations according to their respective organizational policies. The designated number are forwarded to the NARC Executive Secretary and to all other representatives. At an annual meeting early in the year, consensus is developed among the representatives on the final submissions of priorities and/or accomplishments to be forwarded to the Joint Council.

The final submissions may consist of individual reports or consolidated reports based on submissions from one or more member organizations. Some items may be referred to either the National Higher Education Committee or the National Extension Committee as appropriate.

Significant Accomplishments

The NARC developed a new agenda of research priorities and specific objectives for the coming year, bringing together perspectives from industry and from more than 140 State and Federal units engaged in research. The Agricultural Research Service and the Experiment Station Committee on Organization and Policy initiated major internal strategic planning updates, which will be reflected in the next revision.

There was a substantial shift in priorities, with new and increasing emphasis on such contemporary issues as environmental impacts of agricultural operations, food quality, diet-health relationships, food safety, and international competitiveness.

National Extension Committee

There continues to be a major emphasis on using modern molecular biology, computer sciences, and engineering to address contemporary research problems in agriculture, food, natural resources, and forestry.

The NARC placed major emphasis on using a new format that provides an improved perspective for accomplishments from research and that reflects goals of the five-year plan and earlier statements of priorities. In contrast to prior years, the NARC accomplishment report focused on a longer time frame than the immediate past year to provide a better perspective on achievements.

The National Extension Committee (NEC) was established by the Joint Council in 1981 and has met twice annually since that time. The NEC's purpose is to provide better services to the public by fostering improved planning and coordination among Extension and others involved with nonformal education.

The NEC membership represents Extension Lay Leaders, Extension Directors/Administrators, and organizations that have related educational activities. One of the unique aspects of the NEC is its leadership. The NEC organizational structure stipulates that the Chair be elected from the lay leader members. The broad-based membership of the Committee encourages meaningful discussion on substantive issues. Benefits from those discussions are shared with the organizations that the Committee members represent.

How the NEC Relates to the Extension Functional Area

The NEC reviews, conducts substantive discussions, and offers suggestions and recommendations on extension planning and coordination. In accomplishing its mission, the NEC:

- identifies priority education needs.
- promotes new thrusts in the areas of extension education.
- through its membership, interacts and promotes communication within the Cooperative Extension System and organizations, including the Users Advisory Board, non-land-grant institutions, the National Association of State Foresters, National Sea Grant, and the Association of Administrators of Home Economics.

System Used To Request and Receive Submissions

Work groups are set up for identification of priorities and accomplishments. Interaction is carried out within the Cooperative Extension System and with related organizations and special interest groups. Interaction takes place through oral contact and special surveys. Information is obtained from National Program Leaders, National Initiative Team Leaders, and the Accountability/Evaluation System and its electronic databases.

How the NEC Determines Priorities and Accomplishments To Be Submitted

The NEC workgroups provide the potential topics and rationale for priorities and accomplishments to the full Committee. Each topic is discussed thoroughly and additions, deletions, or modifications are incorporated. All Committee members then vote on rankings to be assigned to the individual priorities and accomplishment topics. The top-ranked items are submitted to the Joint Council.

Significant Accomplishments

During 1989, the National Extension Committee:

- Interacted with the ES/USDA-ECOP Strategic Planning Council on national initiatives and priorities for the Cooperative Extension System.
- Met responsibilities for submitting reports to the Joint Council. These are:
 - Extension Priorities for 1991,
 - Extension Accomplishments for 1989, and
 - Chair's presentation to the Joint Council, January 1989.

The Extension priorities are consistent with the Extension National Initiatives being carried out within the Cooperative Extension System. Water Quality and Youth at Risk rank high among these priorities. New priorities emerging during the past year are Agriculture and the Environment, and Agricultural Safety and Health.

- Reviewed, deliberated, and made suggestions on subject-matter items important to the Extension System. These include:
 - Alternative agricultural opportunities and sustainable agriculture, involving a tour of innovative enterprises underway at Agricenter International in Memphis, Tennessee.
 - Electronic information systems, including the Applied Technology Transfer for Rural Areas (ATTRA) Center, the work of the Extension National Database Task Force, and the GOSSYM-COMMAX expert system.
 - Presentations on extension-related activities of the Association of Administrators of Home Economics and the National Association of State Foresters.

Other activities of the National Extension Committee included a September 1989 meeting at Kentucky State University where special emphasis was placed on reviewing the aquaculture, small farm, and family development programs, and other activities underway at that institution.

National Higher Education Committee

Since the beginning of the century the U.S. Department of Agriculture has been cognizant of this country's need for human capital with agricultural expertise. The Department fulfilled its legislative mandate to advance agricultural science and technology utilizing a unique partnership between the Federal and State governments and the private sector. The achievements of this partnership are unparalleled and have resulted in the finest agricultural food and fiber system in the world. In 1977 the role of the USDA in ensuring a steady supply of human capital expertise was specifically mandated by Congress. The Farm Bill of that year designated the USDA as the Federal Government's lead agency for higher education in the food and agricultural sciences. As a result, the USDA office of Higher Education Programs was established in 1978.

Concomitant with the establishment of this office was the mandate by Congress that a Joint Council on Food and Agricultural Sciences be established to coordinate agricultural research, extension, and teaching activities. To assist in fulfilling this congressional mandate, the Joint Council established the National Higher Education Committee (NHEC).

How the NHEC Relates to the Higher Education Functional Area

A tripartite structure consisting of the USDA office of Higher Education Programs, the NHEC, and U.S. colleges and universities is in place to:

- improve coordination,
- raise issues,
- select priorities, and
- submit recommendations to improve American agriculture.

Throughout the decade of the 1980's this cooperative tripartition has worked effectively to collect and coordinate data and information on higher education, implement strategic planning, and develop model systems for the improvement of recruiting and retention efforts, curriculum innovations, faculty development, and career information programs.

Data collection began with the development of the computerized Food and Agriculture Education Information System. These data were augmented by (1) information from a National Science Foundation study on earned doctorates available in the United States, (2) an assessment of the quality of students, graduates, and faculty conducted in partnership with Pennsylvania State University, and (3) the collection of much-needed placement information through the efforts of Louisiana State University. All of these projects were funded by the USDA Office of Higher Education and for the first time provided definitive information on students, curricula, faculty, careers, institutional capability, and national employment demands.

Determining Priorities and Accomplishments for Congressionally Mandated Reports

With these sound data available to the agricultural academic community, plans were formulated to address the most pressing needs of the agricultural higher education system. The NHEC, representing all aspects of agriculture, serves as the vehicle for providing the Joint Council with priorities and accomplishments. Each year, subcommittees of the NHEC collect priorities and accomplishments for the diverse clientele dealing with agricultural academics. These subcommittees call for suggestions from the membership of several associations. All suggestions are brought to the full committee. The NHEC then selects those priorities of central importance and accomplishments that deserve special recognition. A subcommittee is then charged with ensuring that the selected priorities and accomplishments are appropriately presented to the Joint Council.

Significant Accomplishments

The National Higher Education Committee reports accomplishments on: curriculum revitalization, recruitment with special emphasis on minorities, faculty development, and institutional strengthening.

- **Keeping Agricultural Higher Education Curriculum Relevant:** Curriculum revitalization has been encouraged by several projects funded in part by the USDA office of Higher Education Programs. "Curriculum Innovation for 2005" resulted in a national workshop and several publications dealing with the implementation of curriculum change at the local college level. The National Agriculture and Natural Resources Curriculum Project developed two teaching models focusing on a systems approach to agricultural issues and on the ethics of agriculture. Curriculum materials were developed and national faculty workshops were held to stimulate immediate implementation into college curricula.
- **Securing the Necessary Human Capital:** A variety of recruitment efforts, initiated by requests from the NHEC and college clientele and funded by the USDA office of Higher Education Programs, have greatly enhanced the educational system's ability to attract more and better students. The national Agriscience Ambassador Program implemented a national speaking agenda for national spokesperson Susan Forte. Resources for Student Retention were catalogued and disseminated to colleges through the Student Retention Project coordinated at Northwest Missouri State University. The science project workbooks and "Energize the Green Machine" are discussed earlier, in the section on recruitment and retention.

The competitive National Needs Graduate Fellowships program constitutes an investment strategy to recruit truly outstanding students to graduate training in targeted high-priority areas. The quality of students who entered these agricultural research areas has been singular. The impact of this program has been immediate, widespread, and significant. Recently the program has strongly encouraged the

recruitment of minority fellows. Similarly, minorities have been singled out for special attention via projects carried out by the American Home Economics Association, Texas A&I University, Cal Poly-San Luis Obispo, the University of Maryland-Eastern Shore, and the Association of 1890 Deans of Agriculture.

- **Maintaining Our Technological Advantage:** Faculty development and institutional strengthening have been carried out at several major universities who have shared the results of their efforts nationwide. For example, Nebraska and Minnesota have cooperated on a joint faculty development project called New Prof, while the University of Illinois has recently completed a national assessment of faculty development needs and opportunities.

To strengthen the participation of minorities in the food and agriculture system, an institutional strengthening grants program was initiated in 1985 for 1890 land-grant institutions, Tuskegee University, and the University of the District of Columbia. This program has been instrumental in improving the quality of curriculum, faculty, library resources, and instructional equipment. Special Capacity Building Grants and Institutional Challenge grants continue to be a major higher education priority for the development of agriculture's human capital expertise.

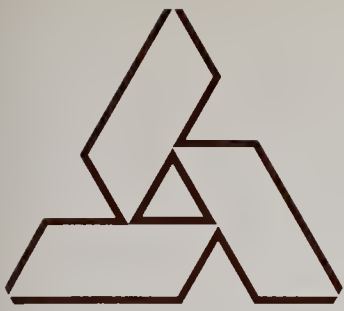
Northeast Regional Council

The Northeast Regional Council is continuing with the development of the action agenda in its future-oriented study *Toward 2005: Issues and Opportunities: Northeast Agriculture-Food-Forestry*. The first area of development has been the dairy industry. A 2-day forum was held in February 1988 in cooperation with the Northeast Center for Rural Development; the Center published the results of the forum as a proceedings. The Northeast Dairy Leadership Group was established as a direct outcome of the forum. The purpose of this group is to provide the leadership and motivation required to mobilize the northeast regional resources in the development of a Northeast Dairy Enhancement Program that will put the northeast regional dairy industry in a more competitive position. This group of industry leaders, under the chairmanship of Norman Harvey, chairman of Agri Mark, a dairy processing cooperative in New England and New York, is developing its program and program implementation based on the six action priorities that were selected at the initial dairy forum.

Western Regional Council

The Western Regional Council met in February 1989 to develop the fiscal year 1991 priorities for the western region. Based on input from the Western Agricultural Committee, the Western Extension Committee, and the Western Higher Education Committee, the council identified six primary societal issues that are important to the western region. The council also identified characteristics of the western region that have a direct impact on priorities established by the Western Regional Council. Based on the overriding societal issues, as well as the characteristics of the western region, the group then identified seven overall priorities for fiscal year 1991. The Western Regional Council emphasized the need for all programs to address total societal needs if the system is to be effective and receive adequate funding, with a major emphasis continuing to be agriculture and home economics programming.

As in previous years, the highest priority items included the protection of water quality and increasing the supply of water, as well as developing economical and environmentally compatible agricultural production systems. High priority was also placed on building support systems for individual families and communities that are essential to the recovery of rural communities in the Nation and specifically in the western region. The Council will meet again in July as a part of the Western Regional Forum in Bozeman, Montana, to identify the future directions of the Western Regional Council and how to better coordinate efforts in regard to the priority-setting process in the West.



IX. Appendixes

Appendix A: The U.S. Food and Agricultural Science and Education System

Cooperative State Institutions:

- Land-grant colleges or universities in each State, as authorized in 1862, plus 16 colleges of 1890 and Tuskegee University, have programs of higher education in the food and agricultural sciences.

- Fifty-eight State agricultural experiment stations (many with networks of substations), plus 17 schools of forestry, and certain schools of home economics and veterinary medicine conduct research programs partially supported by Federal formula funds. Research investment (all sources) was \$1.4 billion in FY 1987 involving approximately 7,800 scientist years (SY) of research effort. (The number of universities involved and the various accounting systems employed by them prevented a FY 1988 recapitulation of expenditures by the time this report was published.)

- Cooperative Extension Services exist in all 50 States plus the District of Columbia and U.S. territories. With total funding at approximately \$1.1 billion, Cooperative Extension programs involved about 15,000 professional staff years, plus almost 3,500 paraprofessional staff years and significant contributions by nearly 3 million volunteers trained and supervised by professional extension staff.

USDA Research and Education Agencies:

- The Agricultural Research Service allocated nearly \$540 million in FY 1988. Research is conducted at 125 locations in the United States and abroad, involving 2,650 SY's.

- The Cooperative State Research Service is the agency of the USDA through which Federal research funding for the States is channeled and coordinated on behalf of the Department of Agriculture, in cooperation with all of the State and Territorial Agricultural Experiment Stations, Colleges of 1890 and Tuskegee University, forestry schools, colleges of veterinary medicine, and other cooperating institutions. The FY 1988 funding level for CSRS was \$352 million. This included \$42.4 million for the Competitive Research Grants program, \$42.5 million for facilities at the land-grant institutions, and \$7.6 million for higher education programs.

- The National Agricultural Library, funded at \$12.1 million in FY 1988 and involving 190.8 SY's, provides wide-ranging library and technical information services.

- The Economic Research Service, with funding of \$48 million for FY 1988, accounts for 383 SY's of economic and social science data collection, research, and analysis.

- The Forest Service research divisions, with about \$133 million in funding (including \$6.0 million in support of a Competitive Forestry Research Grants Program) in FY 1988, provided about 713 SY's of research in resource management and utilization and in resource protection efforts.

- Other USDA agencies have limited but direct research and education roles:

Office of International
Cooperation and Development
Soil Conservation Service
Agricultural Marketing Service

Office of Transportation
Agricultural Cooperative Service
National Agricultural Statistics
Service
Human Nutrition Information
Service

Other Colleges and Universities:

- Approximately 200 other State-supported colleges or universities, including 65 with baccalaureate degree programs, conduct programs of higher education, research, and outreach in the food and agricultural sciences.

Other Federal Agencies:

- At least 14 Federal departments, commissions, and independent agencies besides USDA conduct research and education programs closely related to agriculture and forestry or provide funds to support programs in the USDA-State system. These include:

Department of Health and Human
Services, through National
Institutes of Health
Department of the Interior
Department of State, through the
Agency for International
Development
Department of Commerce
National Science Foundation

Private Firms:

- Research and development (R&D) are performed by equipment, seed, fertil-

izer, and other input suppliers; processors of food and fiber; and specialized private R&D firms. A July 1985 survey published by the Agricultural Research Institute estimates private-sector annual research expenditures of about \$2.1 billion.

- Field personnel and information specialists employed by vendors of food and agricultural supplies, equipment, and services disseminate technical information to farmers and to processors and distributors of agricultural commodities. Consumer service departments of most major food processors develop and deliver a wide variety of nutritional and technical information to consumers. Agriculture-related publications, as well as radio and television, provide timely information that is widely used by those who engage in food and fiber production and processing and is of interest to many consumers as well.

Other Private Organizations:

- Foundations and similar organizations facilitate or channel funds to research and/or education for the public good.
- Associations formed by private firms conduct research and/or educational programs for their members.
- Professional organizations and societies publish scientific papers and provide forums where agricultural research knowledge is disseminated and discussed.

Appendix B: Members of the Joint Council on Food and Agricultural Sciences

Land-Grant Colleges:

Administrative Heads of Agriculture

Dr. H. Rouse Caffey (Cochair)*
Chancellor, Louisiana State University
Agricultural Center
P.O. Box 25203
Baton Rouge, LA 70894-5203

Extension

Dr. Ted L. Jones
Director, Cooperative Extension
Service
University of Arkansas
P.O. Box 25203
Little Rock, AR 72203

Dr. Craig S. Oliver
Associate Vice President and Director,
Cooperative Extension Service
University of Maryland
College Park, MD 20742

Resident Instruction (RICOP)

Dr. Joseph E. Kunsman, Jr.*
Associate Dean, Resident Instruction
College of Agriculture
University of Wyoming
Laramie, WY 82071

Dr. James L. Oblinger
Associate Dean
College of Agriculture and Life
Sciences
North Carolina State University
Raleigh, NC 27695-7601

Research (ESCOP)

Dr. Clive W. Donoho
Director, Georgia Agricultural
Experiment Station
University of Georgia
Athens, GA 30602

Dr. Bill R. Baumgardt
Director, Indiana Agricultural
Experiment Station
Purdue University
West Lafayette, IN 47907

Forestry (NAPFSC)

Dr. Arnett C. Mace, Jr.
Director, School of Forest Resources
and Conservation
University of Florida
Gainesville, FL 32611

Veterinary Medicine

Dr. Robert D. Phemister*
Dean, College of Veterinary Medicine
Cornell University
Ithaca, NY 14850

International Programs (ICOP)

Dr. Harold R. Matteson
Assistant Vice President
Center for International Programs
New Mexico State University
Las Cruces, NM 88003-0001

1890 Research

Dr. Melvin E. Walker*
Associate Dean for Research
School of Agriculture, Home
Economics, and Allied Programs
Fort Valley State College
Fort Valley, GA 31030

1890 Extension

Dr. Fred Harrison
Administrator and Director
School of Agriculture, Home
Economics, and Allied Programs
Fort Valley State College
Fort Valley, GA 31030

*Executive Committee Member

Home Economics

Dr. Beverly Crabtree*
Dean, College of Family and Consumer
Sciences
122 MacKay Hall
Iowa State University
Ames, IA 50011

AASCU/AASCARR Institutions:

Dr. W. Anson Elliot
Head, Department of Agriculture
Southwest Missouri State University
Springfield, MO 65804-0094

Dr. Douglas M. Treadway
President
Southwest State University
Marshall, MN 56258

U.S. Department of Agriculture:

Assistant Secretary, S&E

Dr. Charles E. Hess (Cochair)*
Assistant Secretary
Science and Education
Room 217-W, Administration Building
U.S. Department of Agriculture
Washington, DC 20250

Agricultural Research Service

Dr. R. Dean Plowman
Administrator
Agricultural Research Service
Room 302-A, Administration Building
U.S. Department of Agriculture
Washington, DC 20250

National Agricultural Library

Mr. Joseph H. Howard
Director, National Agricultural Library
Room 109-A, NAL Building
U.S. Department of Agriculture
Beltsville, MD 20705

Forest Service

Dr. Jerry A. SESCO
Deputy Chief for Research
Forest Service
Room 3007, South Building
U.S. Department of Agriculture
Washington, DC 20250

Economic Research Service

Dr. John E. Lee
Administrator, Economic Research
Service
U.S. Department of Agriculture
Room 1226, 1301 New York Avenue
Washington, DC 20005-4788

Foundations:

Dr. Norman R. Collins
Director, Rural Poverty and Resources
Program
The Ford Foundation
320 East 43rd Street
New York, NY 10017

Producers:

Ms. Crete B. Harvey
29919 - 80th Avenue N.W.
Stanwood, WA 98292

Industry:

Dr. Gilbert A. Leveille
Vice President
Research and Technology
Nabisco Biscuit Company
100 Deforest Avenue
P.O. Box 1944
East Hanover, NJ 07936-1944

*Executive Committee Member

Non-Voting (ex officio) Members:

Extension Service (USDA)

Dr. Myron D. Johnsrud
Administrator, Extension Service
Room 340-A, Administration Building
U.S. Department of Agriculture
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Cooperative State Research Service (USDA)

Dr. John P. Jordan
Administrator, Cooperative State
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Office of International Cooperation and Development (USDA)

Mr. Steve Abrams
Acting Administrator, Office of
International Cooperation and
Development
U.S. Department of Agriculture
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International Science and Education Council

Vacancy

Board on International Food and Agricultural Development

Dr. William E. Lavery
Chairman, BIFAD
Virginia Polytechnic Institute and State
University
336 Burruss Hall
Blacksburg, VA 24061

Soil Conservation Service (USDA)

Mr. Wilson Scaling
Chief, Soil Conservation Service
Room 5105A, South Building
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Washington, DC 20250

Higher Education Programs/CSRS (USDA)

Dr. K. Jane Coulter
Director, Higher Education Programs
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U.S. Department of Agriculture
Washington, DC 20250

National Agricultural Research and Extension Users Advisory Board

Ms. Jane Anderson
Executive Director
California Beef Council
551 Foster City Blvd., Suite A
Foster City, CA 99404-1673

National Agricultural Research Committee

Dr. Neville P. Clarke
Director, Texas Agricultural Experiment
Station
Room 308, System Building
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College Station, TX 77843-2147

National Extension Committee

Mr. Harold L. Peyton
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Sac City, IA 50583

National Higher Education Committee

Dr. Paul Hummer
Associate Dean, Resident Instruction
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Northeast Regional Council

Dr. Ruth Tanner
Specialist on Nutrition-Food Chemistry
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Western Regional Council

Dr. Larry Branen
Dean, College of Agriculture
University of Idaho
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*Joint Council on Food and
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